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HOW CAN THE FEDERAL GOVERNMENT BEST RAISE ITS REVENUES?

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THE President of the United States, in one of his recent speeches, was reported as saying: "*I can imagine nothing more important than a revenue system that will provide money enough to run the Government. We have not had enough money to run this Government for the past three years, under a false system of political economy. So the question is, How shall we raise that money? Do you want to raise it by direct taxation, by taxing the property and lands or the incomes and wages of the people?* [*Cries of 'No.'*] *Well, then, the other way to raise it is by taxing the products that come here from Europe in competition with American products.*"

Assuming the above authoritative utterance as in the nature of a text from which deductions are both warranted and desirable for the purpose of popular instruction, the following points ought to commend themselves at the outset to the American people for consideration: *First.* Notwithstanding the great and urgent necessity of currency reform, the need of providing a speedy, certain, adequate, and proper revenue for the Federal Government is of immediate importance. *Second.* No nation exists, or ever has existed, which has such great resources and facilities for obtaining an ample and certain revenue with so little of friction and annoyance to its people and with such a minimum of expense. The amount of our national debt is not alarming, and ought not to be a source of anxiety. As a matter of fact, the United States, notwithstanding its present fiscal disturbance, is in a better finan-

cial condition than any of the other great nations of the world, with the exception of Great Britain and Germany. The United States, Great Britain, and Germany are the only governments that within the last twenty years have notably reduced their national debts; all the other nations have notably increased their indebtedness—France, Russia, and Italy taking the greatest relative lead. In every instance the recent increase in the indebtedness of nations is mainly referable to prospective war expenditure, a contingency from which the United States ought to be entirely exempt; for it is as certain as anything in the future can be, that the United States will never enter into war with any foreign country unless unnecessarily provoked. But this is not the opinion of military men, who as a rule rarely look beyond their profession, and of others who desire war with anybody and on any account by reason of prospective personal agrandizement, or increased opportunities for money gain that war would bring to them, conjointly with increased fiscal burdens upon the masses of the people. From March, 1885, the beginning of Mr. Cleveland's first administration, to March, 1889, the public debt was reduced $341,448,449.20, while Mr. Harrison's administration paid off $236,527,666.10. Circumstances, however, for which the second administration of Mr. Cleveland was not responsible, namely, the advocacy of the so-called "silver policy," which impaired national credit, and a Federal Congress which authorized great and unnecessary expenditures, have caused an increase in the bonded or interest-bearing public debt during the three years from 1894 to 1897 of $262,000,000. But this, in view of the resources of the nation, is not a matter for national disquietude; more especially when it is remembered that the uncovered demand (non-redeemable) debt of the nation was at the same time greatly lessened by the accumulation of redeemable instrumentalities in the national Treasury.

Third. Notwithstanding such favoring fiscal conditions, the Federal Government is now and has been for some time past in default of sufficient revenue to defray its current expenditures. For the fiscal year 1890, with an average rate of taxation of $4.74 *per capita*, its revenues were $105,344,000 in excess of expenditures. In 1895, with an increase in population over 1890 of about 8,000,000 and an average *per capita* rate of taxation of $6.21, the receipts of national revenue fell short of defraying national expenditures to the extent of $42,805,000.

Fourth. Taxes levied for protection—i. e., for the purpose of reducing imports or narrowing the basis on which customs taxes are levied—can not be rightfully regarded as taxes for revenue. No one will deny that to get revenue from customs we must have imports of dutiable goods. And yet, while admitting this as a

general principle, the majority of the men who appear before the "Ways and Means" Committee of Congress generally ask for *prohibitory* duties on the importation of articles that compete with their own products. To the extent that protection is made absolute, to just that extent the customs revenue will be destroyed.* Taxes levied on the importation of commodities that the country does not produce accrue entirely to the benefit of the national Treasury. Taxes levied on the importation of commodities which compete with domestic products are paid by the people, but benefit the Treasury to a very limited extent or not at all. For example, when in 1869 a tax of five cents per pound was imposed on the import of crude or unmanufactured copper, the customs revenue that accrued to the Government in one year (1879) was only five cents; but the taxes levied on the American people through the increase in the price of domestic copper, and effected mainly through the agency of a gigantic monopoly, aggregated millions during the same period.

One almost insuperable obstacle in the way of formulating and instituting a correct system of revenue which pertains to the Federal Government of the United States, does not find a parallel in the administration of the government of any other country in which its people are allowed to participate. As a rule, in such other countries political antagonisms, however bitter they may be on the part of legislators, do not embrace or extend to the business of raising the revenues which are considered essential for the support of the state, although no system of revenue has ever been devised, or probably ever can be, that will not to a greater or less degree be made the subject of popular complaint. In this connection the methods adopted as the result of long experience by the British Parliament for raising revenue and authorizing expenditure in anticipation of the necessities of each succeeding year, are most pertinent, and substantially as follows:

The British fiscal year commences on the 1st of April. In the course of the preceding six months the estimates of expenditures for the ensuing year are prepared with great detail by the heads of the different departments of the Government and submitted to the Chancellor of the Exchequer, who corresponds to the United

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* "Mr. Lawrence, of Ohio, who for years has been most earnest in advocating prohibitory duties on wool, when recently confronted with the fact that his policy would lead to the loss of revenue, said: 'Why should you want any?' When the laugh that followed had subsided, he explained that he meant why should we want any revenue from wool, adding that there were many other commodities from which revenue could be derived. He did not stop to consider that the producers of those other articles wanted duties that would shut out foreign competition as badly as he desired it in his own interest. Moreover, his was a particularly flagrant case, as he represented a commodity of which the country produces only about half as much as we consume."

States Secretary of the Treasury. This official, who is always a member of Parliament, after giving the subject careful study and deliberation, communicates the result to the full Cabinet; and then, with its concurrence, which is regarded as an assumption of responsibility on the part of the existing Government, makes what is called a "Budget" speech in the House of Commons, giving his estimates of the prospective receipts of revenue for the ensuing year, and proposing such changes both in respect to revenue and expenditure as the Government may think advisable. The House of Commons next, and at an early day, resolving itself into a Committee of the Whole under the name of "The Ways and Means," discusses generally the proposed estimates and changes, and at a subsequent period, resolving itself into what is called "The Committee of Supply," decides what services shall be undertaken. In this committee the Secretary of State for War and the First Lord of the Admiralty generally move the adoption of the estimates for the army and navy which the Government has submitted, and preface their motions with a statement of the general condition of their respective departments. The conclusions arrived at in committee, are next reported to the House of Commons, and embodied in a bill known as the "Inland Revenue and Customs Bill;" which, after passing both Houses of Parliament and receiving the "royal assent," becomes the act regulating the collection of revenues for the ensuing fiscal year. Most of the British taxes are levied under the authority of permanent acts. Some, however, as the duty on tea and the income tax, are only granted for limited periods. Certain expenditures, also, are sanctioned by legislation once and for all, and are not revoted every year; such as the interest on the public debt, the "dotation" of the Crown, the salaries of the judges, ambassadors, and other high officials, pensions, and compensations to which the public faith has been pledged. Should any unforeseen demands for large expenditures arise subsequent to the passage of the general revenue bill, supplementary estimates are presented to Parliament by the ministry. This, however, only happens when the deficiency is large. When the deficiency is small—as, for example, if the war office finds it necessary to incur certain expenditures in its branch of the service not provided for in the general estimates and bill—it must apply to the Treasury, stating the circumstances, for leave to meet the expenditures by drawing on any surplus that may accrue in other departments of the Government, with the exception that the navy appropriation can not be applied to meet army expenditures, and *vice versa*. Such permissions, if granted, are only temporary. They are reported to Parliament at the earliest opportunity, and a vote sanctioning its proceedings is asked by the Treasury. When any tax or duty is changed by act of Parlia-

ment, the Treasury authorizes the Inland Revenue and Customs officials to levy the modified rates in a manner that seems to them most expedient.

Any surplus of income over expenditure for any year is devoted to the diminution of the public debt, but so carefully and with such system is the business of collecting and of its expending revenue conducted by the British Government, that except under very unusual conditions, the two accounts, separately aggregating at present about $450,000,000 per annum, balance each other with almost marvelous closeness. Thus, for the fiscal year 1893–'94, a period of great fiscal disturbance and trade depression, the revenue collected and expended was within one half of one per cent, in a total of $450,000,000, of the budget estimate, while the amount of revenue paid out to meet expenditures was about one quarter of one per cent less than the estimates; the whole constituting a most striking testimonial, first, of the solidity of the British financial system, and, secondly, of the great sagacity and experience of the able permanent officials on whom the financial administration of the greatest empire and government of the world mainly depends.

Recognizing also that a rigorous supervision of the governmental estimates and warrant for expenditures by the House of Commons is not possible under the circumstances of parliamentary life, an audit department of the civil service has been created, whose business it is to examine the accounts and vouchers of the expenditures in every branch of the public service; and in addition to this, the House of Commons at every session appoints a public accounts committee of its members, consisting of experienced business men, whose duty is to supervise the work of the audit department. Under such a system extravagance, not to speak of peculations, in respect to the public funds is impossible; and general recognition of this fact goes far to explain why the House, irrespective of any political differences of its members, readily grants the sums of money asked by the existing ministry.

There is another feature of the parliamentary government of Great Britain which is well worthy of serious attention on the part of the American public and its representative law makers; and that is, that by a standing order of the House of Commons no member of the House, unless he is charged with the administration of a department, and therefore with the duty of framing the fiscal estimates of such department, can, however eminent, influential, and capable he may be, on his own authority propose in Parliament to grant any sum of public money, however small, to any object, however deserving. The theory of this is, that the Government, which is the ministry in power, is entirely responsi-

ble for all public expenditures involving taxation during the term that it is in office; and that to permit private members or political opponents to propose expenditure of the public moneys would not only transfer responsibility from those who ought to bear it, but would lead to great financial disorder and vast and inexpedient expenditures. The great mass of the civil servants of the British Government are also strictly excluded from seats in Parliament, and until recently were debarred from voting for members; the reason for such provisions being that those who have personal interest in taxation because they have improvable property or incomes from taxes, ought to have no voice, direct or indirect, in the imposition of taxes, on the same principle that judges are considered disqualified for trying cases in which they may have or are presumed to have any personal interest. On the other hand, in the Federal Congress, where lavish and unexpected grants of public money are constantly made on motions of members not connected with any finance committee, and acting avowedly in behalf of private or local, rather than public, interests; and where the authorization of expenditures is divided among a number of committees so that no group of men is responsible for the aggregate appropriations; it is obviously not within the power of the executive department of the Government to present and adhere to any previously well-considered scheme of annual taxation and expenditure, or what in most other countries is known as an annual budget.

The following record of recent experiences, which probably could not happen in the legislature of any other civilized country, strikingly illustrates the senseless and costly way in which the fiscal policy of the United States is not infrequently determined. During a comparatively recent fiscal debate in the United States Senate, a Senator advocated certain proposed appropriations of the public money, which were opposed on the ground that they were in the nature of extravagances, by saying that they could not be grievous to the people, "since they would not amount to more than *three* cents per day *per capita*." But three cents per day would amount to nearly eleven dollars per head per annum, or over fifty-five dollars for every family of five persons, and there are millions of men and millions of families in the United States whose income is not a dollar a day. Again, how many of the American people are aware that a bill proposing to grant pensions to seventy thousand ex-slaves, on the ground that they were chiefly instrumental in developing the wealth of the country, is reported to be now pending in the United States Senate? Such a bill, if once passed, would establish the principle of pensions for civil service, and by swelling the existing pension list to an inordinate amount would almost justify the assumption, that the

main object of a government by the people is the payment of pensions rather than the protection of life and property.

THE PROSPECTIVE REVENUE REQUIREMENTS OF THE FEDERAL GOVERNMENT.—The aggregate revenues of the Government for the fiscal year 1897–'98 are estimated, on the basis of existing laws, by the Secretary of the Treasury (Report on the State of the Finances, 1896) at $421,227,000; and the estimates of appropriations, exclusive of sinking fund, required for the same period, are $466,946,000; leaving a prospective national deficit of revenue for the next fiscal year of $45,719,000. The total appropriations of the two sessions of the past (fifty-fourth) Congress aggregate $1,043,437,019. Under such circumstances a provision for an annual revenue of more than $500,000,000 is therefore most expedient, and the question at issue of first importance is, How can this sum be raised with the greatest certainty, regularity, and minimum cost to the Government, and with the least inconvenience and friction on the part of the people who will have to provide it? For the Government never has any money—by which alone the expenses of the state can be defrayed—except what the people—citizens or subjects—give or concede to it by voluntary or involuntary action; while the people, as a whole and in turn, never have any to give except what comes to them as a result of their work, or from an exchange of the products of their work. And such being the case, we are confronted with a homely truth, generally overlooked by writers and legislators on taxation, that what the Government really wants of its people, when it calls upon them for taxes, is work, and that the methods of taxation are only methods for collecting and using the products of work. Furthermore, it ought also to be borne in mind that for every dollar the Government at present expends, the average American citizen must work for at least half a day, or furnish a value equivalent for such an amount of work.*

Another matter of almost equal importance for consideration in this connection is the desirability of initiating an adequate revenue system for the national Government, the elements of which shall be rendered in a high degree permanent, by exemption from influences contingent on changes in the political administration, and on temporary commercial and industrial conditions of the country. In fact, it would be difficult to name an influence more certain to be conducive to national prosperity than the realization of such an agency.

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* "Taxation means work, of the head, or the hand, or of the machine, or all combined. And the method of taxation is only a method of distributing the products of work. It is measured, when in the process of distribution, in terms of money, but the money itself stands for work, or is derived from work."—*The Industrial Progress of the Nation, Edward Atkinson; G. P. Putnam & Sons, New York, 1890.*

To obtain a clear understanding of these subjects, the most rational, and indeed the only correct way, is to take up and submit to analysis the most available sources of national revenue, commencing with those that are beyond question the most important. But, preliminary to so doing, attention should be given to the fact that in all civilized nations at the present time the production and consumption of spirits, fermented liquors, and tobacco are recognized as the most legitimate and productive sources from which revenue can be obtained with the minimum of expenes and industrial disturbance. The factors determinative of the productiveness and continued increase of revenue from these sources are mainly two—namely, continued increase of population and continued or increasing ability on the part of the masses to consume. These factors are more influential at the present time in the United States than in any other nation. We are increasing in population in a greater annual ratio than any other country. Our ability to consume, owing to the rapid accumulation and distribution of wealth among the masses, is far greater than that of any other nation. Commercial disturbances and business depressions, which are potent in all other countries in reducing the consumption of luxuries, appear to have comparatively little effect in the United States, and are not of long continuance.

Thus, of the commodities in general use in the United States, the two that have not notably declined in consumption during the almost universal depression of industry in recent years are fermented liquors and manufactured tobacco, more especially in the form of cigarettes.

The single source from which the largest amount of revenue is collected by the Federal Government is distilled spirits, and the experience of the United States in respect to it, although exceedingly curious and interesting, has been but little instructive to either the people or their legislators. From the first imposition of taxes on this commodity under the present revenue system in 1862, unwarranted sentiment, rather than intelligence and regard for the fiscal interest, of the nation, have characterized its treatment. There has been, in the *first* instance, a comparatively small number of people—132,871 voting for prohibition in 1895 out of an aggregate of 13,790,572 other voters—who take the position that it is the moral duty of the state to absolutely prevent the manufacture, sale, or use of all alcoholic liquors; a result not possible of attainment except through a radical change in human nature. The results of experience under this head may be briefly summed up as follows: In small communities, where there is a general union of sentiment in favor of extreme temperance, a high degree of prohibition may be temporarily brought about. But,

on the other hand, the evidence of the only reliable data available, namely, the tabulated returns of the Internal Revenue Department, which takes cognizance of every gallon of distilled spirits—other than illicit products—manufactured and sold for consumption in the United States, indisputably show, that for the whole country the efforts of the extreme temperance advocates have never exerted any general influence in restraining their manufacture and use; and that, eliminating the temporary influence of hard times and business depressions, the average annual increase in the production and inferential consumption of such spirits, is at a rate equal to or in excess of the average annual increase of population. Thus, during the decade from 1880 to 1889 the aggregate increase in the population of the country and its consumption of tax-paid spirits was nearly concurrent; but from 1888 to 1893 the increase in the production and *per capita* consumption of spirits was in a ratio much greater than any concurrent increase of population; the whole culminating for the fiscal year 1893 in a tax-paid product of 99,145,000 gallons, and an average *per capita* consumption of 1·48 gallons, as compared with a *per capita* of 1·25 in 1889.

Secondly. We have a general sentiment among both people and legislators, that distilled spirits and alcoholic preparations generally are commodities that can advantageously be made subject to any degree of taxation. If under a given rate the revenue increases, an increase in the rate is held to be desirable; if the revenue falls off, the decrease is attributed to decreased consumption, whereby any loss of revenue is correspondingly compensated by moral advantages. But there is in the enactment of any and every tax a certain rate which, if exceeded, invariably impairs the maximum possible revenue obtainable from it; and any government that disregards what may be termed the line of wise expediency in fixing such rates, invariably cheats itself and promotes popular immorality. One would think that the experience of the United States had been sufficiently instructive in this matter. But such is not the case. The class of people whom the proverb says "go to the school of experience" have all been there and have paid "high tuition"; they have also exemplified the remainder of the proverb as expressed by Franklin, to wit, that the number of scholars that learn anything in such school "is small, for it is true that we may give advice but can not give conduct." Under such circumstances the following brief notice of some of the lessons that have been taught in this school may be profitable. Thus during the fiscal year 1868, with a tax of two dollars per proof gallon on distilled spirits, the Internal Revenue Bureau in full operation and an annual consumption of the country of at least 60,000,000 gollons, the Government was only able to collect a tax

on less than 7,000,000 gallons, leaving to the credit of corruption from the sale of the balance of concurrent annual product, at market rates, of from $80,000,000 to $100,000,000. But with a reduction of the tax to fifty cents per proof gallon the annual revenue, including all taxes on the process of manufacture and sales, increased the first year to $45,000,000, and the second to $55,606,000.

By the Act of August 28, 1894, the rate of tax on distilled spirits, which had been in force for fifteen years and was working satisfactorily, was prospectively advanced from ninety cents to a dollar and ten cents per proof gallon. Note the result. For the first six months of 1894 the average monthly revenue which accrued from the lesser tax was about $8,000,000. Then the prospective profits from the increase of the tax were anticipated to such an extent by speculators, that the revenue increased during the month of July and for the first twenty-seven days of August to $19,064,000 and $21,470,000 respectively, representing an aggregate gift to the speculative interest of about $24,000,000. The increased rate of tax having become operative, the revenue for the month of September declined to the comparatively small sum of $510,696. Stated generally, the total receipts from the *direct* tax of ninety cents per proof gallon during the fiscal year 1893 was $89,231,000; for 1894, with increased rate for part of the year, it was $79,862,000; for 1895, $74,741,000; for 1896, $75,327,897. That a considerable part of this recent decline has been due to a contemporaneous depression of the business of the country is beyond question; but what is to be inferred from the following official statement as to the manner in which the decreased production of spirits in the United States distributed itself during the year 1895: *decrease* in the production of alcohol, neutral or cologne spirits, 16,065,000 gallons; increase in the production of Bourbon whisky, rye and miscellaneous liquors, 6,924,773 gallons? These figures do not include illicit production, which is certainly very considerable; and one effect of the increase of tax in stimulating this business may be inferred from the fact that the number of illicit stills seized and destroyed increased from 1,016 in 1894 to 1,874 in 1895.

Another point of interest in connection with the increase of the rate of taxation on distilled spirits in 1894, and to a certain extent contingent on such increase, is, that the business of manufacturing whisky has been so stimulated, with a resulting overproduction, that the average market price of this commodity, exclusive of taxes, has been reported as below the cost of manufacture, and in accordance with this view of the situation nearly all the large distillers of the country have united in suspending operations.

Under a former rate of duty of ten per cent on the importation

of diamonds, $100,000 on duties representing a value of $1,000,000 was reported as collected at the single port of New York. With an increase of duty to twenty-five per cent, little or no revenue is derived from that source.

The best and most reliable data for estimating the maximum revenue resulting from the taxation of distilled spirits is to be found in the experience of the Internal Revenue Department for the fiscal years from 1887 to 1893 inclusive. During these years, under a uniform and stable rate of taxation, a good and efficient administration of the law, and a fairly prosperous condition of the country, the average increase in revenue was nearly $5,000,000 ($4,910,000) per annum; the whole culminating in the fiscal year 1893 in a revenue of $89,231,000. In a report made by the writer to the Secretary of the Treasury in July, 1893, the sequel of any increase in the then existing rate of tax (ninety cents), which was at that time to some extent advocated, was foreshadowed in the following language: "It will favor a recurrence of the disgraceful and disastrous results that characterized the period of experimental taxation in the years immediately succeeding the termination of the war. Certain it is also that an anticipation of participation in an increase of the tax would lead to such a production of spirits as to postpone for one or two years any increase in revenue to the Government." It is needless to say that every prediction thus made has been fully verified, and, encouraged by such success, the following anticipations may be warranted: If our legislators in Congress assembled, agreeing to limit all consideration of the subject to the one point of revenue, will reduce the present rate of tax per proof gallon of distilled spirits from $1.10 (about 825 per cent) to the former rate of ninety cents (690 per cent), with no exemptions, and the industry of the country again become fairly prosperous, the average *per capita* consumption of 1892 and 1893 may be fairly taken as the basis of future estimates from the greatest and most reliable single source of national revenue. Or, in other words, an annual revenue, under such conditions, approximating one hundred millions may be anticipated in 1899, with a certain regular increase contingent on a normal increase in population of from three to four millions additional per annum.

THE ALCOHOL EXEMPTION PROPOSITION.—A brief notice of a proposition to essentially impair the revenue from distilled spirits by exempting alcohol used in comparatively few manufacturing industries and in the preparation of "medicinal and other like compounds" from taxation is here pertinent. The history of this movement constitutes an extraordinary feature in American fiscal experience, and in brief is as follows: When "an act to reduce taxation, to provide revenue for the Government, and for

other purposes" (passed August 28, 1894) was under consideration by the United States Senate, and pending a proposition to increase the revenue by increasing a tax of about 680 per cent on the average prime cost of distilled spirits to a rate of nearly 825 per cent, a Senator, apparently utterly oblivious that the subject involved had years before been thoroughly considered by the United States Treasury Department and declared to be impracticable, submitted a motion permitting the use of alcohol in the arts, or in medicinal or other like compounds, without the payment of any internal revenue tax. The motion in question, after a very brief consideration, was accepted and incorporated in the laws of the United States. The result was that the Secretary of the Treasury reported that in default of any appropriation to defray the expenses of administering the act, and an unsuccessful attempt to frame regulations which would protect the Government, the Treasury Department was constrained to abandon the effort and await further action by Congress. It was also estimated that the expense to the Government of attempting to administer the act would probably be not less than one million dollars per annum; that the loss of revenue contingent on its enforcement would be about ten million dollars yearly, and that the loss of revenue from an increased opportunity for illicit and fraudulent practice would also be very considerable.

Under such circumstances Congress, in 1895, repealed the act of exemption, but subsequently a strenuous effort has been made to re-enact it. The main argument adduced in its favor is that the present cost of alcohol would be largely reduced, whereby certain industries which use it as a raw material would be greatly benefited. That such a result would be in accordance with a general economic principle can not be disputed, and, such being the case, the question is pertinent. Why limit the exemption to the one material, alcohol? Why not equally grant exemption to manufacturers who use wool, coal, the various ores and metals, crude tobacco and the like, as raw materials?

As already pointed out, the taxation of distilled spirits constitutes the largest single source of national revenue, and as such, its consideration by legislators, more especially in view of the present fiscal necessities of the Government, ought to be strictly limited to the one point of ascertaining its greatest availability for revenue. The existing tax of 800 per cent on proof spirits and more than 1,200 per cent on its derivative, alcohol, constitutes a temptation to evade payments which human nature as ordinarily constituted can not withstand. Illicit distillation is admitted to be on the increase in the country, and American ingenuity has been active in facilitating it. It is now proposed to further increase temptation by offering an approximate profit of two

dollars for every gallon of alcohol that can evade taxation. The annual loss of revenue consequent upon the proposed exemption of alcohol will not be less than $10,000,000 and probably more, all of which, under present revenue necessities, will have to be made good by an equivalent increase of taxation on other commodities.

The circumstance that some of the countries of Europe, especially Great Britain, allow alcohol mixed exclusively with naphtha (methyl), and in very large stipulated quantities, to be exempt from taxation, but the use of which, from the nauseous smell and taste thereby imparted, is exceedingly limited, has no bearing on the situation in the United States. In Europe the process of methylation is conducted under the close supervision of revenue officials, as it must be in the United States. In the former countries the number of grain distilleries, with bonded warehouses attached, where the process must be mainly conducted, is comparatively small. In the United States it is comparatively large; the number operated in the single State of North Carolina in 1895 being largely in excess of the number in the whole of Great Britain. If, in addition to the number of inspectors and gaugers required at the distilleries for an honest administration of the exemption, the number of druggists who use alcohol in medicinal preparations (which has been officially estimated as at least 32,000) and manufacturers of patent medicines are taken into account, the problem confronting the administration of the Internal Revenue Department of the Government might be well characterized as "appalling." In short, if the exact truth in respect to this proposed modification of the taxes on distilled spirits were known, it would probably appear that the people most interested in securing this exemption are the patent-medicine manufacturers, who see a great extension of their business in manufacturing cheap intoxicants without the compulsory use of methyl, under the name of medicinal preparations, and selling them by the bottle from the apothecary's shelf, rather than from the bars of hotels and restaurants. And this assumption finds much of confirmation in the circumstance that in respect to the applications filed in the Treasury for rebates, or damages for the non-execution of the exemption law, which are very considerable, estimated at from $10,000,000 to $19,000,000, the Internal Revenue reports that a large proportion of the claimants are manufacturers of patent medicines, and also to some extent the manufacturers of "mince pies" and candy. Recent investigations instituted and reported by the Massachusetts State Board of Health also show that many of the most noted patent medicines, especially the so-called "blood purifiers," "nerve tonics," and other remedies of like character, contain very large per-

centages of alcohol by volume—not infrequently from seventeen to twenty-six per cent—which probably accounts in a high degree for their great popularity, and for the wonderful curative results contingent on their use. Country druggists also report a special demand and consumption of these medicinal preparations in towns that have voted "no license," and in which a sentiment in favor of total abstinence predominates.*

Again, if the legislative department of the state decides that it would be expedient to establish or stimulate the manufacture of certain commodities, no one under a free Government would venture openly to justify such action, except on the ground that public welfare would be thereby promoted. Suppose, with this purpose in view, it is decided to stimulate the manufacturers of a comparatively few articles by exempting them from certain forms of taxation, would it not be expedient, and the part of a wise fiscal policy, that the state, by proper rules and investigation, should ascertain the rightful amount that would accrue to each claimant from such exemption, and then raise the money to pay it in the same manner as it raises money to defray its other expenses, and not allow private interests to exercise the great sovereign power of taxation by practically determining what the state shall levy and what the people in general shall pay?

FERMENTED LIQUORS.—The internal revenue tax on fermented liquors (beer) has been practically uniform since its first authorization in 1863, nominally one dollar per barrel of thirty-one gallons. As, however, a deduction of seven and a half per cent is allowed to brewers on the purchase of stamps, which is assumed to represent the difference between the theoretical barrel unit of thirty-one gallons and the quantity contained in the commercial or trade supply barrel, which, owing to redriving of hoops and repitching, averages from twenty-eight to twenty-eight and a half gallons, the net tax is, accordingly, ninety-two and a half cents, which is made payable in stamps, one of which, "denoting the amount of the tax, shall be affixed upon the spigot hole or tap (of which there shall be but one) in such a way that the stamp shall be destroyed upon the withdrawal of the liquor from the barrel or other receptacle." There is also a special tax, in the nature of a license on brewers, which yielded the Government—in 1896, $163,779—relatively a small matter. A tax of one dollar per thirty-one gallons is equivalent to 3·225 cents per gallon. On a basis of $5.25 per barrel, the price at which beer of good quality could recently be bought in quantity, or at wholesale, in the city of New York or vicinity, the present tax is about twenty per cent

* For more specific information on this subject, reference is made to an official bulletin of the State Board of Health of Massachusetts for March 14, 1896.

ad valorem. One barrel of thirty-one gallons equals 248 pints or 496 half pints. The present tax on this basis is, therefore, one fifth of a cent per half pint, or per glass as usually sold in saloons for five cents; or two fifths of a cent per pint.

In recent years some of the large industrial establishments of the country have made a practice of furnishing their employees with beer of a good quality at a price but little in excess of the cost of production. In such cases the beer is sold by weight, a pint being regarded as equal to a pound, and a pound as equal to two glasses such as are usually sold in the saloons. From twenty-six to thirty tickets, each representing one pound of beer, are usually sold for one dollar, which makes the average cost to the local consumers of from one and two thirds to one and three fourths cents for a full glass or half pound of beer, and which charge is represented by those competent to express an opinion as sufficient to cover the wholesale price and entire cost of distribution—labor, ice, rent, and light—and leave a fair profit.

The points of interest worthy of special attention in connection with this subject are as follows:

1. The regular and great increase in the quantity of fermented liquors annually made subject to internal revenue taxation—i. e., from 62,205,375 gallons in 1863 to 1,110,609,000 in 1896; an increase in popular consumption very far in excess of the rate of increase in the population of the country—i. e., from 1·86 gallon per head in 1863 to about sixteen gallons in 1896, the latter representing an average consumption of about 100,000 barrels daily.

2. The concurrent regular increase in revenue from this source has been from $1,558,000 in 1863 to $33,784,255 in 1896.

3. As large and costly plants are essential for the manufacture of fermented liquors on a large scale and at the lowest cost, illicit production is thereby rendered difficult, if not impossible; and whatever of fraud upon the revenue exists in this business is undoubtedly due to the non-use or non-cancellation of the stamps which represent prepayment as a condition of sale and consumption.

4. The variations in the product of fermented liquors which the Government has been able to annually subject to taxation since 1863 have been inconsiderable and in remarkable contrast to those occurring in the case of distilled spirits. The average increase in the receipts of internal revenue from this source for the ten years from 1883 to 1892 was about $1,617,000 per annum; the *per capita* consumption during the same period increasing from 10·25 gallons to 15·05 gallons. Comparing 1894 with 1893, there was a remarkable decrease in revenue in the former year of $1,134,195. Comparing 1895 with 1894, there was a recuperation in receipts to the extent of $225,829; which augmentation in 1896—

a year of continued great depression in the industry of the country—rose to the large figure of $2,143,617. That this latter ratio of annual increase under the present rate of tax is likely to indefinitely continue is almost demonstrated by the fact that the popularity of fermented or "malt" liquors as beverages among the American people is unquestionably increasing; and also that large, seemingly, as is their present average *per capita* consumption—namely, sixteen gallons—the present *per capita* consumption of the people of several other nationalities is much greater—that of the United Kingdom being estimated at thirty gallons; of England and Wales, thirty-six; of Belgium, thirty-two; of the whole of the German Empire, thirty-three; of Bavaria, sixty-two.

An important fact pertinent to the prospective consumption of beer and its permanent value as a source of national revenue is, that the cost of the materials used in its manufacture has decreased in comparatively recent years, in the United States, Great Britain, and probably in other countries characterized by its large consumption, to the extent of at least forty per cent;* and the advantage from this change which has accrued to British brewers was stated by the British Chancellor of the Exchequer, in May, 1895, to have been upward of £2,000,000 ($10,000,000) per annum.

From this decline in prices, and consequent reduction in the cost of production, the consumer has not been permitted to gain any advantage, the retail price of beer remaining substantially what it was.

All the resulting gains have been intercepted by those connected with the trade, and how well they have fared, some statistics recently given by the British Chancellor of the Exchequer, and which are probably equally applicable to the United States, sufficiently show. "In 1884–'85," he said, "the number of assessments to income tax from brewers was 2,446, and the whole of their profits assessed amounted to £6,316,000. Ten years later the number of brewers assessed for income tax was 2,274—show-

* In the United States the decrease in this branch of prices has been much greater, as shown by the following table of comparative prices in 1877 and 1897:

	1877.	1897.	Decrease, per cent.
	Cents.	Cents.	
Sugar (brown).....lb.	9·5	2·81	70·4
Rice, Carolina.....lb.	6·5	4·0	38·5
Hops (import price).....lb.	51·5	22·0	57·2
Barley (import price).....bush.	76·2	37·8	50·4
Oats.....bush.	44·0	21·0	52·2
Maize.....bush.	60·0	28·5	52·5
Molasses (prime).....gal.	54·0	24·0	55·5

ing that the smaller brewers were being more and more absorbed by the great concerns—while the amount of assessed profits was £10,177,000, showing an increase of sixty per cent in the profits of the brewing trade during those ten years."

If it is desirable at the present time for the Federal Government to increase its annual revenue by additional taxation, it is certain that such a result can not be attained more certainly and with so little of expense, effort, or industrial friction, as by a moderate increase of the tax on fermented liquors. The existing tax (twenty per cent ad valorem) is lower than upon almost any other industrial product entering largely into domestic consumption—spirits paying, for example, eight hundred and forty per cent; tobacco, one hundred and nine; wool, manufactured, fifty-six; iron and steel, forty-eight; breadstuffs, twenty-five; glass, fifty-two, and the like. The business of brewing malt liquors is acknowledged to be one of the most successful of domestic industries, and financial participation in it has in recent years been so attractive to foreign capitalists that it is generally believed that the ownership of a large proportion of the brewing business in the United States has passed into their hands. It is also reasonably certain that in the distribution of industrial products for consumption there is no branch of business that returns a larger profit on the labor and capital employed than the retailing of malt liquors; a small retail store often supporting a large family, besides paying high Federal and State licenses. The data already submitted, which are believed to be reliable, show that beer can be retailed at a profit for one and three quarter cents per glass of a half pint, on which the present tax is one fifth of a cent, yielding a present revenue of about $34,000,000 ($33,784,000) per annum. An increase of the present rate of tax—i. e., from one dollar to two dollars per barrel of thirty-one gallons, or from one fifth to two fifths of a cent to a half-pint glass—might be reasonably expected to at once yield at least $30,000,000 additional per annum, bringing up the present annual revenue from this source to $64,000,000, with a prospective annual increase of $3,000,000; and this without increasing the cost of his beer to the individual consumer or materially diminishing the profits of the brewer or the wholesale or retail dealer.

It remains to briefly notice the reasons that have been popularly urged against any increase in the taxation of fermented liquors. It is said that the brewers already pay a fair share of the expenses of the Government, and "to make them pay more looks like a discrimination against a particular industry." But as the case now stands, the discrimination in respect to taxation is not adverse to the brewing interest but greatly in its favor; and the proposed increase in rate would impose a smaller burden,

as has been above shown, than is borne by many other domestic industrial products. Again, it is said that "beer is the poor man's bread," and therefore it ought not to be taxed. But if beer is exempted from making a fair contribution to the revenue necessities of the state, the deficiency will be made good by increased taxes on other commodities of general popular consumption, the ultimate incidence of which, if indirect, as they are likely to be, will fall heaviest on the consumer who, by reason of his poverty, is forced to buy in small quantities. The most potent source of opposition, however, to an increased tax on beer is undoubtedly to be found in the popular assumption that "no political party will commit itself to an additional tax of a dollar a barrel on beer, because it is feared that it would involve the loss of too many votes. It somehow happens that beer has a great many friends, and, whether correctly or not, it is apprehended that doubling the tax on it would be resented by a large number of voters." And if partisan politics is to become the essential feature of the revenue system of every popular form of government, as the experience of the United States and of France seems to indicate it will be, nothing further need be said on this subject.

TOBACCO.—The present consumption of tobacco in all its forms by the people of the United States will probably average about four pounds per head per annum. The aggregate quantity which the Internal Revenue took cognizance of for taxation in 1896 was 266,215,736 pounds, a gain of 18,136,846 pounds over the aggregate for 1894. The number of cigars and cheroots subjected to taxation preliminary to consumption in 1896, was over four billions (4,237,755,943), an increase over the number assessed in the preceding fiscal year of 73,983,503. As a basis for estimating the revenue prospectively available from this source, the comparative *per capita* consumption of tobacco in other countries is especially worthy of attention in this connection. For the United Kingdom the amount for 1891, officially reported, was 1·61 pound; France (estimated), 1¼ pound; for the population of the city of Paris, 3½ pounds; Germany, 4½ pounds; Belgium and Holland, 3½ pounds. The annual consumption of tobacco in the United States is therefore certainly much greater than in most other countries, and is equaled in not more than one or two. This result may be referred to several agencies: to the greater cheapness of the taxed commodity; to greater ability on the part of the masses to consume it, and to a larger use of tobacco for chewing,* the quantity manufactured for this purpose in 1895 being

* In France the sales of tobacco in 1885 were returned at 700,000 kilogrammes for "chewing" and at 15,400,000 for smoking.

returned at 181,494,000 pounds, as compared with 83,346,000 manufactured for smoking.

From 1863 (when the tax was first imposed on this commodity) to 1869 the variations in the annual internal revenue receipts from tobacco (always in the way of increase) were very great and, as it were, spasmodic, and were due mainly to frequent changes in the rate of tax on the different forms of tobacco. During this same period occurred one of the most remarkable illustrations to be found in fiscal history of the influence of a tax reduction in increasing the consumption of a comparatively cheap commodity in general use. Thus, in 1866, with a uniform tax of ten dollars per thousand on cigars, only 347,443,894 were returned by manufacturers for taxation, while in 1869, under a uniform tax of five dollars per thousand, 991,335,934 were returned, or nearly three times the quantity.

From 1870 to 1882 the ratio of annual increase in the taxed product of domestic tobacco was greater on the average than the corresponding ratio of increase in the population of the country; and in the latter year the annual internal revenue collected from this source attained the large and unprecedented aggregate of $47,391,989.

In 1883 the rates of tax on all forms of domestic tobacco and the special taxes on dealers and manufacturers of the same were reduced fully fifty per cent. This reduction of tax caused an immediate reduction of revenue, comparing the receipts of 1882 with those of 1884, the first full year of reduced rates, to the extent of $21,329,589. In 1886 the tax on cigars was further reduced fifty per cent, and in 1890 the taxes on snuff, chewing and smoking tobacco, twenty-five per cent. At this latter date all special taxes relating to tobacco—i. e., licenses to manufacturers, dealers, etc.—were also entirely repealed. The annual reduction in revenue in consequence of these last abatements, comparing the receipts for 1890 with those for 1892, was near $3,000,000, notwithstanding an increase in population during the same period of 2,897,750. The internal revenue from tobacco for the fiscal year 1896 was $30,711,629, an increase of $1,006,721 over the receipts for 1895, and a decrease of $3,277,372 as compared with the receipts of 1890. Had the taxes on tobacco existing in 1882 been allowed to remain unchanged, the annual revenue from this source (the increase of population being taken into account) for the fiscal year 1897 would probably have approximated $70,000,000.

The United States internal revenue taxes on tobacco are smaller than those imposed by any other country that seeks to make this commodity a leading source of revenue. In the year 1895 they amounted to about forty cents *per capita*. The duties collected on imports of tobacco for 1895 were $14,916,000, and

the total customs and internal revenue yielded by tobacco during the fiscal year 1895 was about $44,000,000, or sixty-eight cents *per capita*.

In the United Kingdom the taxes on tobacco, mainly on imports and through the customs, are about $1.30 *per capita*, and yield an annual revenue of about $50,000,000.

In France the taxes on tobacco are reported at $1.71 *per capita*, yielding an annual revenue of about $65,000,000. In other European countries the *per capita* taxes on tobacco are reported as follows: Austria, $1.31; Germany, $1.30; Italy, 94 cents; Hungary, 79 cents.

Were the same ratio of taxation on tobacco as exists to-day in the United Kingdom established in the United States, the annual revenue accruing to the Federal Treasury at the present time would be in excess of $90,000,000. If the rates existing in France were adopted, the annual revenue from this source would be $126,000,000.

Whatever may have been the considerations that prompted in recent years the abatement of this important source of national revenue in the United States, it is certain that they were not based on any sound financial policy, or on any lesson of past experience in respect to the best methods of raising revenue. Taxes on tobacco are taxes on a typical luxury. Their payment is not obligatory, as are the taxes on the essentials of living, on any citizen, but are in the nature of a voluntary assessment on the part of the consumer, on whom the entire burden of the tax ultimately rests, and which payments may be properly regarded as representing his surplus income. They are not obstructive to the development of any other industrial product, and there is no evidence that the highest rate ever assessed under the internal revenue has ever been productive of general discontent on the part of the masses of the American people.

The popular argument that a low rate of tax should be imposed on tobacco, because the burden of it falls mainly and disproportionately upon the poorer classes, has no foundation in fact. If the exact facts could be known, it would probably be found that by far the greater portion of the tax is paid by the well-to-do part of the community, who consume the high grades of tobacco. Again, the revenues of the Federal Government are almost exclusively derived from taxes on commodities which are paid by their consumers; and when any deficiency of needed revenue is occasioned by the reduction or entire abatement of the taxes on any one commodity or class of commodities, the deficiency must be made good by new or increased taxes on other commodities, the consumption of which is often more essential to the poorer classes than the article exempted. Thus, for exam-

ple, the consumer of any class can better afford to pay taxes on his tobacco—in the form of chewing, snuff, smoking, cigars, and cheroots—than he can on foods, fabrics, and the raw materials of his industry. Another point generally overlooked in this discussion, is that when a tax which is direct, as is the tax on tobacco and spirits, is shifted to a supplementary tax which is indirect, the consumer may feel certain that his burden of tax will be augmented very considerably, often to the extent of twenty-five and even fifty per cent, by payment of profits to merchants and other middle men.

STAMPS AS SOURCES OF REVENUE.—The instrumentality of stamps as a means of obtaining revenue, although attended with less friction and expense than almost any other methods, and which was advantageously incorporated in the war system of taxation, can hardly be said to have had a place in recent years in the internal revenue system of the Federal Government; the stamps used in connection with the taxation of distilled spirits, fermented liquors, and tobacco—which are peculiar to the United States and not in use for like purposes in any other country—being rather in the nature of instrumentalities for facilitating the collection of taxes than independent sources of revenue. In fact, the only strictly revenue-producing stamp tax now existing is the tax of two cents per pack on playing-cards, the receipts from which declined from $382,402 in 1895 (the first year of its imposition) to $259,853 in 1896—a result that certainly warrants the modified application of an old proverb that, "under a free government, the rulers may propose taxes, but the people will dispose of them."

Under the fiscal system of the British Government (United Kingdom) the revenue which accrued in 1893–'94 from stamps was £12,799,000 ($62,244,000). The sources from which this aggregate of stamp revenue was obtained are numerous and of a character that are not in the main applicable to the fiscal system and Government of the United States, and for the most part are classified as follows: Probate duties; legacy duties; duties on estates, real and personal; succession duties; capital duties on companies; receipts; records; patent medicines; marine insurances, etc.* In fact, it is said that you can do nothing of any consequence in Great Britain without a stamp of some kind.

A system of taxation through the instrumentality of stamps can, however, be devised and made a permanent feature of the

* Under the British system foreign bonds, whether issued by a state, a municipal body, a corporation, or a company, are chargeable with stamp duty if made or issued in the United Kingdom; or if offered for subscription and given or delivered to a subscriber in the United Kingdom, though originally issued abroad; or if assigned, transferred, or in any manner negotiated in the United Kingdom, provided the interest is payable in that country.

internal revenue of the United States, which, in respect to facility, economy of administration,* and productiveness of revenues, ought to have much to commend itself. A system formulated by discarding, if thought expedient, all stamp taxes on drafts, checks, promissory notes, receipts, releases, matches, etc., as vexatious rather than valuable, and making their fixation and cancellation obligatory on every deed, mortgage, or certificate of stock at the time of their transfer of ownership, by sale or otherwise, at the rate of fifty cents per every thousand dollars of their face value, and every fractional part thereof, would be highly productive of revenue and have much otherwise to recommend it. A man that sells or transfers a farm or mortgage, or a certificate of stock, for $10,000, would not think a stamp of five dollars very burdensome. In its applicability to the purchase and sale of real estate it would have the characteristics of a land tax, the incidence of which, although always and necessarily equitable, proportionate, and free from anything like discrimination, would be the lightest on lands uncultivated or devoted to agriculture, and heaviest on lands at the great centers of population and trade, for the purchase of which its surface must be, as it were, always covered with gold.† It probably would not be agreeable to speculators in stocks, to the creators of fictitious "trusts," or to the directors of swindling railroad, mine, and other like organizations, who, if not benefited in respect of their profits, might be to some extent as to their morals. Such a tax, moreover, would be as readily and economically collected as that of the postage stamp, and, like the latter, would have to be paid for before using. How much revenue would annually accrue to the national Treasury from such a system of taxation through stamps is not easy to estimate, but undoubtedly it would be very considerable. In the way of information helping to form an opinion on this subject the listing of stocks and bonds on the New York Stock Exchange during the year 1896, exclusively to replace old securities, is reported as amounting to nearly $1,175,000,000. During the recent years of business depression an average yearly sale of 56,000,000 shares of stock in New York city is reported; but during what are re-

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* The cost to the Government in 1868 of revenue stamps for checks, drafts, receipts, and other like instruments, was twelve and a half cents per thousand. The cost of collecting the entire receipts of the internal revenue in 1894 was 2·70 per cent.

† "A million dollars and half a million more were recently paid for five lots on Broadway, New York, opposite Bowling Green. This was the value of the land alone, as the old buildings it bore were at once to be torn down. A year or two ago the corner of Liberty Street and Nassau, measuring seventy-nine feet along the one and one hundred and twelve along the other, and about one hundred feet in depth, brought $1,250,000, and this, again, for the sake of the land alone."—*Places in New York, Mrs. Van Rensselaer, Century Magazine.*

garded as prosperous times the yearly aggregate of sales not infrequently exceeds 100,000,000 shares.

PETROLEUM AND ITS DERIVATIVES.—Another source of revenue readily and largely available to the Federal Government, which since 1868 has almost entirely escaped attention, is petroleum and its derivatives. The present annual production of these commodities is probably about 54,000,000 barrels, and of this product the present annual domestic consumption is estimated at 28,000,000 barrels of forty-two gallons each, or 1,176,000,000 gallons. Of the balance of product, in either a crude or refined state, 931,785,000 gallons were exported in 1896, and therefore exempt from taxation. A tax of two cents per gallon, or eighty-four cents per barrel, on domestic consumption, which could be as readily collected through the agency of stamps as the taxes on distilled spirits, fermented liquors, and tobacco, might yield an approximate annual revenue of $24,000,000. An interesting circumstance in this connection, and one strikingly illustrative of the remarkable change in the industrial and fiscal relations of this product in the last thirty years, is to be found in the fact that when refined petroleum was previously taxed by the Government the rate was fifteen cents per gallon in 1866 and ten cents in 1867; the amount brought to charge during the latter year being 24,999,000 gallons, as compared with over 1,000,000,000 gallons accessible at the present time.

Inasmuch as the Federal revenue, customs and internal, is derived on principle almost entirely from the taxation of commodities of common and popular consumption, especially from distilled spirits, fermented liquors, tobacco, and sugar, there is no good reason why, if a present additional and prospective increase of revenue is needed, a commodity properly belonging to the natural resources of the country, and which has proved a source of immense wealth to those concerned in its distribution, should not also contribute to the expenses of its Government, more especially when fully one half of the domestic product, by reason of its being exported, would not be subject to any form of taxation. That a tax of two cents per gallon would probably be entirely transferred by an additional price to the consumer is almost certain; and yet that there would be no necessity for such action would seem to be proved by the circumstance, that in recent years the market price of refined petroleum for considerable periods has varied more than the proposed rate of tax without any recognized restriction of supply on the part of the trust that controls its product.

TEA AND COFFEE AS SOURCES OF NATIONAL REVENUES.—The policy of making the consumption of tea and coffee sources of national revenue through customs taxation on the imports of these commodities has much to recommend it. The present annual con-

sumption of tea in the United States is about 94,000,000 pounds, and of coffee about 600,000,000 pounds; the importation of these two commodities in 1895 having been, however, considerably greater—namely, of tea, 97,168,866 pounds, and of coffee, 655,564,000 pounds. A levy of three cents a pound on tea and three cents a pound on coffee would yield a present annual revenue in excess of $20,000,000, and represent an *ad-valorem* rate of about twenty per cent on both commodities—rates that would probably not interfere with their popular consumption in the least degree. If sugar, a commodity of more indispensible popular use, is regarded as not overburdened by a tax of forty per cent *ad valorem*, tea and coffee could easily stand a like duty. This would make the tax on each article six cents a pound, with an accruing revenue at the present rate of consumption of more than $40,000,000 per annum. Under the revenue system existing in 1870, coffee was taxed five cents a pound and tea twenty five cents, and the aggregate revenue from both commodities was $22,881,000. The arguments in opposition to imposing a duty on imports of tea and coffee are, mainly, two: First, that it is inexpedient to antagonize a free breakfast table; second, that customs taxes ought not to be imposed on the imports of commodities not produced in the United States.

Now the popular phrase "a free breakfast table" is a mere sentimental expression, and in relation to fiscal matters an absurdity, even if its authorship be attributed to as high authority as Mr. Gladstone. A free breakfast table, in the sense of the complete exemption of all its constituents from taxation, is utterly impossible in a civilized country where taxation is essential to the support of a government; and the only place where an approximate result could be attained would be some tropical isle where a native obtains his breakfast by pulling a banana from a tree, extracting a yam from the ground, or catching something which the sea supplies gratuitously. Think of the nature of a statute which, in order to meet the requirements of a free breakfast table in the United States, would exempt from taxation everything generally used in connection therewith—china, crockery, earthenware, glass, hardware, fish, flesh, cereals, fruits, and vegetables—and make the same subject to taxation to meet the requirements for revenue when otherwise utilized. The *second* antagonizing argument is equally unwarranted and absurd. Customs taxes on the importation of articles not produced in this country are the only taxes on imports in respect to which the people can have an assurance that, apart from the small cost of assessing and collecting, the Government will certainly receive all that they pay; and any man who argues to the contrary does not know what he is talking about, or has the idea that taxes on

imports should be levied, not merely for revenue and the support of the state, but also in furtherance of some individual interests.

SUGAR.—Next in importance to the domestic consumption of distilled spirits as an easily available source of national revenue is the consumption of imported sugars. In the twenty-four years from 1867 to 1890, when imported sugars paid duties, the lowest sum received in any one year was $31,000,000 (in 1872), and the highest $58,000,000 (in 1887). After 1885 to 1890 inclusive at least $50,000,000 annually could be counted upon from this one item of imports, and the duty, estimated on an *ad-valorem* basis, varied from sixty-two to seventy-eight per cent, according to the fluctuations in the price of sugar. Such a long average degree of taxation made but little change in the consumption of the country, distributed itself very evenly over the whole population, and averaged less than seventy cents *per capita* of a population ranging from fifty to sixty millions. After April, 1891, duties on sugars were abolished, except half a cent a pound on sugar above No. 16 (continued with a view of protecting the refining interests of the United States), on confectionery, and small discriminating duties on sugars coming from countries which are believed to pay a bounty on exported sugars. The results of this extraordinary policy, which has been not inaptly characterized as one of the most disgraceful pieces of fiscal legislation ever perpetrated in a free country, was that the duty on imported sugars, which amounted to over $50,000,000 in 1891, ran down to $176,795 in 1892, and $163,956 in 1894. The Government, moreover, with a practical repeal of all duties on raw sugars, began the disbursement of money for bounties on domestic sugar, which amounted in round numbers since 1892 to about $35,000,000. Increased importations brought up the revenue from sugar to $15,599,342 in 1895, and $29,897,000 in 1896, the latter representing an import of 3,666,842,395 pounds, which, if subjected to a duty of one cent per pound, would have yielded a revenue of $36,666,000.

With the absolute necessity for increased revenue to meet increased expenditures, there is no good reason why the duties on the import of sugars should not be so adjusted as to insure a permanent annual revenue of at least $50,000,000, which amount, with a consuming population smaller by at least ten millions, was exceeded in 1885. During the month of January, 1897, the import price of sugar was two cents per pound for cane and one and nine tenths for beet. If on this basis of import prices the average rate of duty under the present tariff—namely, forty per cent—were levied, only four fifths of a cent a pound duty would be collected.

A question of importance which next presents itself, and about

which there is a great difference of opinion, is, the form in which the duty on the imports of sugar shall be assessed—*specific* or *ad valorem?* To help to the formation of a correct opinion on this subject, attention is asked to the following exhibit of the nature and practical workings of these two forms of taxation. The *ad-valorem* system, proportions duties to the worth of the goods at the place of shipment at so much per cent of their market value. Its chief merit is its justice and equity. It adjusts itself automatically to differences of valuation or of commercial qualities, so that the tax collected from the consumer varies in proportion to his ability to pay—at least so far as this may be determined by his ability to buy goods of greater or less cost.

The chief demerit commonly ascribed to it is the temptation which it is said to offer to fraudulent undervaluation. Since the duty to be paid depends upon the foreign value, if this can be made to appear less than it really is, some part of the tax is evaded, and the cost of the goods to the importer diminished. The difficulty of evading a customs revenue under a good and intelligent administration through undervaluation is illustrated by the circumstance that, in order to secure a saving of as much as six per cent on the landed cost of goods, the dishonest importer in the case of a forty-per-cent duty would have to swear an undervaluation of more than twenty per cent. On the other hand, the great advantage of a simple specific duty is the care and certainty with which it may be applied. If, for instance, the duty upon a class of textile fabrics should be fixed at forty cents a pound, including all accessories involved in packing, the weight of the contents of a case would show, by simple multiplication, the exact amount of duty to be paid. No expensive process of examination need be entered upon. Disputes can hardly arise, and false swearing is out of the question. Such duties have been found most useful when imposed upon simple articles not produced in widely varying grades of greatly differing commercial values.

The injustice and inexpediency of specific duties are, that they bear so much less heavily upon the high-priced than upon the low-priced qualities of goods, that the poorer classes of the community are taxed at a much higher rate than the richer. Neither do they adjust themselves to ups and downs of market values; and a rate of duty reasonable enough when enacted is often transformed by a fall of price into an onerous and prohibitory tax restricting imports and diminishing revenue. It is not, therefore, surprising that the attempt had been made to unite, if possible, the certainty and inevitableness of the specific system with the justice and equity of the *ad-valorem* principle. Two methods of combination of specific and *ad-valorem* rates have therefore heretofore been adopted.

Viewed from the standpoint of equity and expediency, the proposition to assess all the varieties of imported sugars at one and the same rate of duty is something extraordinary. The United States, for the attainment of its fullest material development as a nation, must have foreign commerce. It desires to attract all nations to its markets; and, except when it is itself made the subject of discrimination, it must, for the attainment of this end, admit to equal privileges the people of all nations desiring commercial intercourse. Were the proposition soberly made to discriminate specially and by name, in our commercial laws, against any one, two, or more unoffending nations, the proponent would be speedily hooted into silence. But the proposition to assess raw sugars at one rate embodies this very thing. Thus, to illustrate, the sugars produced in countries of low civilization, like Brazil, Central America, the East Indies, and the like, *constitute the bulk of the sugar product of the world*, and are low in grade and price, and necessarily so because these countries lack intelligence and capital. Such sugars are, however, capable of purification without difficulty, and afford the largest basis in so doing for the profitable employment of domestic labor and capital. The producers, furthermore, must sell them in our markets if they in return are to buy any of the products of our skill and machinery, for they have little or nothing else to buy with. Such raw sugars naturally command the lowest prices in the world's markets. On the other hand, the raw sugars produced in Cuba and Demerara are much further advanced in manufacture, and are largely known as "centrifugals," from having been subjected to a purely mechanical (rotary) process of refining. Such raw sugars command the highest prices, and are worth on the average at least fifty per cent more than the sugar products of countries of a low civilization. A uniform duty on all raw sugars of one cent per pound would, therefore, be equivalent to an *ad-valorem* tax, or tax on market value, of about fifty per cent on the cheaper grades, and about twenty-five per cent on the highest grades; or, in other words, if the Government, under a uniform rate of one cent, were to collect its (customs) taxes in kind on sugar, it would take one half the importations of low-grade sugars, while only one fourth of the importation of high grades would be taken for the same purpose. All the machinery of the Government is now adapted to the *ad-valorem* system of taxing sugars, and in the opinion of the Treasury officials it can be and is honestly administered.

It is difficult to see why, with an impending deficiency of national revenue, sugar grown in the Hawaiian Islands, and the importation of which into the United States in 1895 exceeded 280,000,000 pounds, should be admitted free of duty. Is it not

clear that such an exemption constitutes another and indirect form of taxation incumbent on the American people?

WHAT THE NATIONAL REVENUE WAS IN 1896, AND WHAT MIGHT BE ANTICIPATED IN THE IMMEDIATE FUTURE FROM CERTAIN MODIFICATIONS OF THE EXISTING TAX SYSTEM.—The revenues of the Government from all sources—exclusive of the postal service, in which the receipts and expenditures closely balance—for the fiscal year 1896 were $326,976,200, of which $146,762,864 accrued from internal-revenue taxes, and $160,021,751 from customs.

Contingent on the modifications of the internal-revenue system above proposed, the annual receipts from this department, considered in reference to the special sources pertaining to it, would, without much doubt, be approximately as follows:

From distilled spirits, provided there is no exemption of any part of its product from taxation for any purpose, $100,000,000: a result more likely to be attained if the present ratio of tax, $1.10 per proof gallon, be reduced to its former rate of ninety cents.

From fermented liquors, with an increased tax to the extent of $1 per barrel, $60,000,000.

From tobacco, on the assumption that political and popular sentiment will not permit any increase of rates, $35,000,000; although, if a fiscal policy in furtherance of the best interests of the Government were alone considered, the annual accruing revenue from this source would be at least double.

From petroleum and its derivatives, $24,000,000.

From stamps, $30,000,000, which can be readily increased to $50,000,000.

From tea and coffee, under a twenty-per-cent duty, $20,000,000; under a duty of forty per cent, $40,000,000.

From sugar, such a rate of duty on its import as will insure an annual revenue of at least $50,000,000.

Total, $319,000,000, leaving a deficit, on an estimated annual expenditure of $500,000,000, of $189,000,000. To meet this requirement, the entire revenue from customs, other than from the imports of sugar (already considered), and incidental revenues to the extent of $15,000,000, are available.

Doubtless, to many the proposal to increase the existing number of special sources of national revenue, with modifications of existing rates, will seem inexpedient and unnecessary; but, with a constant tendency to increase national expenditures, it is only a question of time when such changes will have to be made; and the future record of the new administration and the new Congress, for good or for ill, will be largely determined by the manner they answer this question: Shall money be saved by new

economies or provided by new and increased taxes? And if the latter policy is favored, its advocates will do well to remember, that any taxes that tend to obstruct the export of the surplus products of the country will not long be tolerated.*

THE STABILITY OF TRUTH.†

By DAVID STARR JORDAN,
PRESIDENT OF LELAND STANFORD JUNIOR UNIVERSITY.

[*Concluded.*]

THE primal motive of science is to regulate the conduct of life. This is in a sense its ultimate end, for it is the first and the last function of the senses and the intellect. If science has any message to man, it is expressed in these words of Huxley: "There can be no alleviation of the sufferings of mankind except in absolute veracity of thought and action and a resolute facing of the world as it is, with all the garment of make-believe thrown off."

"Still, men and nations reap as they have strewn." The history of human thought is filled with the rise of philosophic doctrines, laws, and generalizations not drawn from human experience and not sanctioned by science. The attempt to use these ideas as a basis of human action has been one of the most fruitful sources of human misery. It is true that wrong information may sometimes become the basis of right action, as falsehood may secure obedience to a natural law which might otherwise be violated. But in the long run men and nations pay dearly for every illusion they cherish. For every sick man healed at Denver or Lourdes, ten well men will be made sick. Faith cures and patent medicines feed on the same victims. For every Schlatter who is worshiped as a saint, some equally harmless lunatic will be burned as a witch.

And now a word as to the positive side of scientific belief.

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* Touching the question of national revenue and its present yearly deficiency, the following opinion, expressed by the late Secretary of the Treasury, in his annual report on the finances of the country for 1896, has an important bearing on this problem, and ought not to fail of popular consideration: "Hereafter," he says, "it will not be possible to sacrifice revenue to protection without seriously embarrassing the fiscal affairs of the Government by depriving it of an income sufficient to defray its necessary expenditures. If the usual proportion of this income is hereafter to be derived from taxes on imported goods, the protective theory must be abandoned as the basis of our legislation upon the subject, and a well-considered and consistent revenue system must be substituted in its place; and, in my opinion, this can be done without material injury to any trade or industry now existing in this country."

† President's address, California Science Association meeting, Oakland, December, 1895.

I was walking not long ago in the garden with a little girl, to whom I told James Whitcomb Riley's story of the "goblins that get you if you don't watch out"—a story supposed to be peculiarly attractive to children. "But there isn't any such thing as a goblin," said the practical little girl, "and there isn't ever going to be any such thing." Mindful of the arguments of Berkeley and Balfour, I said to her in the spirit of philosophic doubt, "Maybe there isn't any such thing as anything, Barbara?" "Yes, there is," she said, "such a thing as anything," and she looked about her for unquestioned reality; "there is such a thing as anything; there is such a thing as a squash."

And in this conclusion of the little girl the reality of the objective world, the integrity of science, and the sanity of man are alike bound up. And for its evidence, if we are not confined to Balfour's arguments in a circle, we may look to the facts of organic evolution, of which the existence of man is a part.

Each living being is a link in a continuous chain of life, going back in the past to the unknown beginnings of life. Into this chain of life, as far as we know, Death has never entered, because only in *life* has the ancestor the power of casting off the germ cells by which life is continued. Each individual is in a sense the guardian of the life-chain in which it forms a link. Each link is tested as to its fitness to the conditions external to itself in which it carries on its functions. Those creatures unadapted to the environment, whatever it may be, are destroyed, as well as those not adaptable; and this environment by which each is tested is the objective universe. It is not the world as man knows it. It is not the world as the creature may imagine it. It is the world as it is.

Nature has no pardon for ignorance or illusions. She is no respecter of persons. Her laws and her penalties consider only what is, and have no dealings with semblances. By this experience we come to know what reality is, that there is an external world to the demands of which our senses, our reason, our powers of action are all concessions. The safety of each chain of life is proportioned to the adaptation of its links to these conditions. This adaptation is in its essence obedience. The obedience of any creature is conditioned on its response in action to sensations or knowledge. Sense perception and intellect alike stand as advisers to its power of choice. The power of choice involves the need to choose right. For wrong choice leads to death. Death ends the chain of which the creature is a link, and the life of the world is continued by those whose choice has not been fatal. That "the sins of the fathers are visited on the children" is, in the long run, the expression of Infinite Mercy, "the goodness and severity of God." Severity of condition and

stress of competition are met in life by the survival of those adequate to meet these conditions. Thus "in creatures sore bestead by the environment" when instinct and impulse fail, reason rises to insure safety. At last with the civilized man reason comes to be a chief element in guiding the choice of life.

With greater power to know and hence to choose safely, greater complexity of conditions become possible, and the multifarious demands of modern civilization finds some at least who can meet them fairly well. To such the stores of human wisdom must be open. To others right choice in new conditions is possible only through following the footsteps of others. The multitudes of civilized men, like the multitudes of animals, are saved to life by the i stinct of conventionality. The instinct to follow those whose footsteps are secure is one of the most useful of all impulses to action. In the same connection we must recognize authority as a most important source of knowledge to the individual. But its value is proportioned to the ability of the individual to use the tests wisdom must apply to the credentials of authority. But instinct, appetite, impulse, conventionality, and respect for authority all point backward. They are the outcome of past conditions. "New occasions bring new duties." New facts and laws must be learned if men are to remain adequate to the life which their own institutions, their self-realization, and their mutual help have brought upon them. To the wise and obedient the most complex life brings no special strain nor discomfort. It is as easy to do great things as small, if one knows how. But to the ignorant, weak, and perverse, the growth of civilization becomes an engine of destruction. The freedom of self-realization involves the freedom of self-perdition. Hence appears the often discussed relation of "Progress and Poverty" in social development. Hence it comes that civilization, of which the essence is mutual help or altruism, under changing conditions seems to become one vast instrument for the killing of fools.

In the specialization of life, conditions are constantly changing. Every age is an age of transition, and transition brings unrest because it impairs the value of conventionality. With the lowest forms of life there is no safety save in absolute obedience to the laws of the world around them. This obedience becomes automatic and hereditary because the disobedient leave no chain of descent to maintain their disobedience. All instincts, appetites, impulses to action, even many conditions of the nature of illusions, point toward such obedience. Whether we regard these phenomena as variations selected because useful, or as inherited habits, their relation is the same. They survive as guarantees of future obedience because they have brought obedience in the past. And so with the most enlightened man, the same necessity for

obedience exists, and the instincts, appetites, and impulses of the lower animals remain in him, or disappear only as reason is adequate to take their place. And in any case there is no alleviation for the woes of life, "save the absolute veracity of action; the resolute facing of the world as it is."

The intense practicality of all this must be recognized. The truths of science are approximate, not absolute. They must be stated in terms of human consciousness, and they can never be dissevered from possible human action. Knowledge which can only accumulate without being woven into conduct has never been a boon to its possessor. As food must be formed into tissue, so must perception go over into action. In the lower forms, we have the devices, chiefly automatic, by which sensation transmitted to the sensorium reappears as motion. In like manner we find in man, besides these reflex transfers, and the reflex connections formed by habit, that science becomes changed to art and knowledge to power. Power and effectiveness are conditioned on accuracy. Every failure in the sense organ, every form of deterioration of the nerves, shows itself in reduction of power. Reduced effectiveness shows itself through the processes of natural selection, as reduction is safety in life. Thus the degeneration of the nervous system through excesses, through precocious activity, or through the effect of stimulants shows itself in untrustworthy perceptions, in uncontrolled muscles, and in the lack of security in life. Incidentally all these are recorded by fall in social standing. With the reduction of the accuracy of recognition of reality the person ceases to hold his place as a man among men.

Similar failure comes with any cause impairing the recognition of the reality of external things. The sober mind is necessary to safety in life. In general all civilized men are well born. They come of good stock. For the lineage of perversity, insanity, and even stupidity is never a long one. The perverse, insane, and the stupid live through the tolerance of others. They can not maintain themselves, and, in spite of charity and the sense of conventionality, the mortality caused by the fool-killer is something enormous. It is an essential element in race progress. It grows with increased civilization, because of increasing complexity of condition. It is the chief compensating influence for the life-saving which has been made possible for scientific research. As Prof. H. H. Powers has said, "There is in civilization not a single vice that race progress can spare." "The fool-killer," Dr. Bailey tells us, "the fool-curer, and the fool-preventer are alike servants of the living God."

The recent "recrudescence of superstition"—a striking accompaniment of an age of science—is in a sense dependent on science.

Science has made it possible. The traditions of science are so diffused among the people at large that fools find it safe to defy them. Those who take dreams for realities; those whose memory impressions and motor dreams are uncontrolled through defective will; those who mistake subjective sensations produced by disease or disorder for objective conditions—all these are sooner or later dropped from existence, taking with them the whole line of their possible successors. The condition of mind which is favorable to mysticism, superstition, and revery is unfavorable to life, and the continuance of such conditions leads to death. On the billboard across the street I saw just now the advertisement of a lecture on the "ethical value of living in two worlds at once." Whoever thus lives in two worlds is certain soon to prove inadequate for either.

If all men sought healing from the blessed handkerchief of the lunatic, or from contact with old bones or old clothes; if all physicians used "revealed remedies," or the remedies Nature finds for each disease; if all business were conducted by faith; if all supposed "natural rights" of man were made the basis of legislation; if all the protean phases of that which Zangwill has cleverly called the "higher foolishness" were worked out in action—the insecurity of these beliefs would speedily appear. Not only civilization but civilized man himself would vanish from the earth. The safe shelter of the cave and hollow tree would be the cradle of the "new man" and the "new woman." The long and bloody road of progress through fool-killing would for centuries be traversed again. The fool lives in society only by sufferance of the sane; the weak, by the altruism of the strong. That is strong which endures. Might does not make right, but that which is right will justify itself by becoming might. What we call social virtues are the elements of race stability.

In the ordinary affairs of life it may be as safe to believe in mahatmas and magic, in cobolds and norns, as to have the vague notions of microbes and molecules, atoms and protoplasm, which form part of the mental equipment of the average modern man. But the difference appears when the knowledge is to be turned into action. Microbes and molecules become more real the more nearly one comes to deal with them. If one learns to use them they become as real as rocks or dollars and as capable of influencing human welfare. But those conceptions which are figments of ignorance and insanity become less real as we try to deal with them, and the action based on them is not safe nor effective.

So clearly is knowledge linked to action that in general among animals and men when action is not possible sensation is absent or not trustworthy. Objects too small to be touched are invisible

to the eye. Objects beyond our reach, as the stars or the clouds, are not truthfully pictured. Accuracy of perception grows less as distance increases. The unfamiliar lends itself readily to illusions; the familiar is recognized chiefly by breaks in continuity. The real forces of Nature are hidden by their grandeur, by their immortality. Men see the form of the surface, but not the mighty tides that move beneath it. Again, the senses are less acute than the mechanism of sense organs would make possible. This is shown through occasional cases of hyperæsthesia or ultra sensitiveness. This occurs in abnormal individuals or in unusual conditions. It occurs normally in creatures whose lives in some sense depend on it. Thus some of the most remarkable exhibitions of "mind reading" may be paralleled by retriever dogs whose reason for existence is found in the hyperæsthesia of the sense of smell. Hyperæsthesia of any of the senses would be to most animals a source of confusion and danger rather than of safety.

Man's high development of the brain in large degree takes the place of acuteness of special senses. It is part of the function of the will to keep down the senses; and in his perception of external relations he is aided by the devices of science, which may be taken up or laid down at will. By means of instruments of precision any of the senses may be aided to an enormous degree, and at the same time the personal equation or individual source of error is largely eliminated. The use of instruments of precision is the special characteristic of the advance of science. No instrument of precision can give us the ultimate essence of any part of the universe. No scientific experiment can do away with the measure of human experience as the basis of intelligibility. At the same time we can throw large illumination into "the dimly lighted room" in which, according to Balfour, the phenomena of consciousness take place. By the simple process of photography, for example, we may reproduce the objects of our environment. That such pictures do express phases of reality admits of no doubt, for in the photographic camera all personal equation is eliminated. As to form of outline and reflection of light, the "sun paints true," and the paintings thus made by means of the action of nonliving matter produce on our senses impressions coinciding with those of the outside world itself.

How do we know this is true? Because belief in it adds to the safety of life. We can trust our lives to it. If it were an illusion it would kill, because action based on illusion leads to death.

One can trust his life, for example, to the message sent on a telegraph wire. All who travel by rail do this daily. One can trust his life to the reading of a thermometer. The chemist's

tests will select for us foods among poisons. We may trust these tests absolutely. We may safely and sometimes wisely take poisons into our bodies if we know what we are doing. By the advice of a physician, trusting in the weigher's instruments of precision, poisons may do no harm. One grain of strychnine may be an aid to vital processes; a dozen may mean instant cessation of these processes. The balance advises us as to all this. All these instruments of precision belong to science. These are examples taken from thousands of the methods of organized common sense. By means of common sense, organized and unorganized, all creatures that can move are enabled to move safely. The security of human life in its relations to environment is a sufficient answer to the "philosophic doubt" of Berkeley and Balfour as to the existence of external Nature; for if all phenomena were within the mind, no one of them could be more dangerous than another. A dream of murder is no more dangerous than a dream of an afternoon pink tea, so long as its action is confined to the limits of the dream; but the relation of life to environment is inseparable and inexorable. Cause and effect are perfectly linked. This is a world of absolute verity, and its demand is absolute obedience. Life without concessions of conditions is the philosopher's dream.

What we know as pain is the necessary signal of warning of bad results, of bad relations. Without pain life conditioned by environment would be impossible. We need such stimulus to veracity. Those dangers which are painless are the hardest to avoid; the diseases which are painless are the most difficult to cure. Misery in general is only Nature's protest against personal degradation. The way out of misery is the way into life.

In this relation must science recognize the value of ideals? The ideal in the mind tends always to go over into action. The noble ideal discloses itself in a noble life. It is part of the wisdom of each generation, its science as well as its religion, to form the ideals of the rest. History is written in these ideals before it is come to the stage of life. An ideal is not a dream; a dream is fleeting. An ideal has the *will* behind it. The persistence of a lofty ideal is the central axis of the life worth living.

An old parable of the conduct of life shows man in a light skiff in a tortuous channel beset with rocks, borne by a falling current to an unknown sea. He is kept awake by the needs of his situation. As his boat bumps against the rocks he must bestir himself. If this contact were not painful he would not heed it. If it were not hurtful he would not need to heed it. Had he no power to act, he could not heed it if he would. But with sensation, will, freedom to act, narrow though the limits of freedom be, his safety rests in some degree in his own hands. That he has

secured safety thus far is shown by his continued existence. He may choose his course for himself—not an easy thing to do, unless he scans most carefully the nature of the rocks and waves and his control of the boat itself. He may follow the course of others with some degree of the safety they have attained. He may follow his own impulses, in man's case inherited from those who found them safe guides to action. But in new conditions neither conventionality nor impulse nor desire will suffice. He must know what is about him in order that he may know what he is doing. He must know what he is doing in order to do anything effectively. Ignorant action is more dangerous than no action at all. The "sealed orders" under which live the lower animals and our "brother organisms the plants" are in a measure inadequate for man. With the power of movement and the "knowledge of good and evil," he has no choice but to accept the conditions. He must shape his own life. He must make his ideals into actuality. And thus it comes that there is "no alleviation for the sufferings of man except through absolute veracity of thought and action, and the resolute facing of the world as it is." For wisdom is only knowing what should be done next, and virtue is doing it. And thus it comes that it is well for man "not to pretend to know or to believe what he really does not know or believe"; for there is no safety in life, either for ourselves or others, if we guide our conduct by any influence less wise or potent than that developed from the co-ordination of human wisdom. We may play at philosophy, if we have pleasure in doing so. We may find intellectual strength through exercise of the mind even on its own products. But we must guide our lives by science. The appetites, impulses, passions, illusions, if you choose, which have proved safe in the past development of life, science would not destroy. But they must be subordinate to the will and intellect. And this subordination of the lower to the higher motives in life is the culmination of evolution, as it has been the ideal of those whose strivings for better relations of man to man and of man to Nature have been worthy of the name of religion.

The will is the soul of man in action. The intellect is its guide. If the life of man is hemmed in by the Fates, the human will is one of the Fates, and must take its place by the side of the rest of them. The man who can will is a factor in the universe.

As knowledge is in its essence only a guide to action, and as knowledge, being human, can be approximate only—not reality, but a movement toward reality—we are brought to the oft-quoted words of Lessing:

"It is not the truth in man's possession that makes the worth of the man. Possession makes him selfish, lazy, proud. Not through possession, but through long striving, comes the ever-

growing strength. If God should hold in his right hand all truth and in his left hand only the ceaseless struggle to reach after truth, and he should say to me, Choose; I would fall in humbleness before his left hand and say:

"'Father, give; the perfect truth is but for thee alone.'"

THE RACIAL GEOGRAPHY OF EUROPE.

A SOCIOLOGICAL STUDY.

(*Lowell Institute Lectures, 1896.*)

By WILLIAM Z. RIPLEY, Ph. D.,

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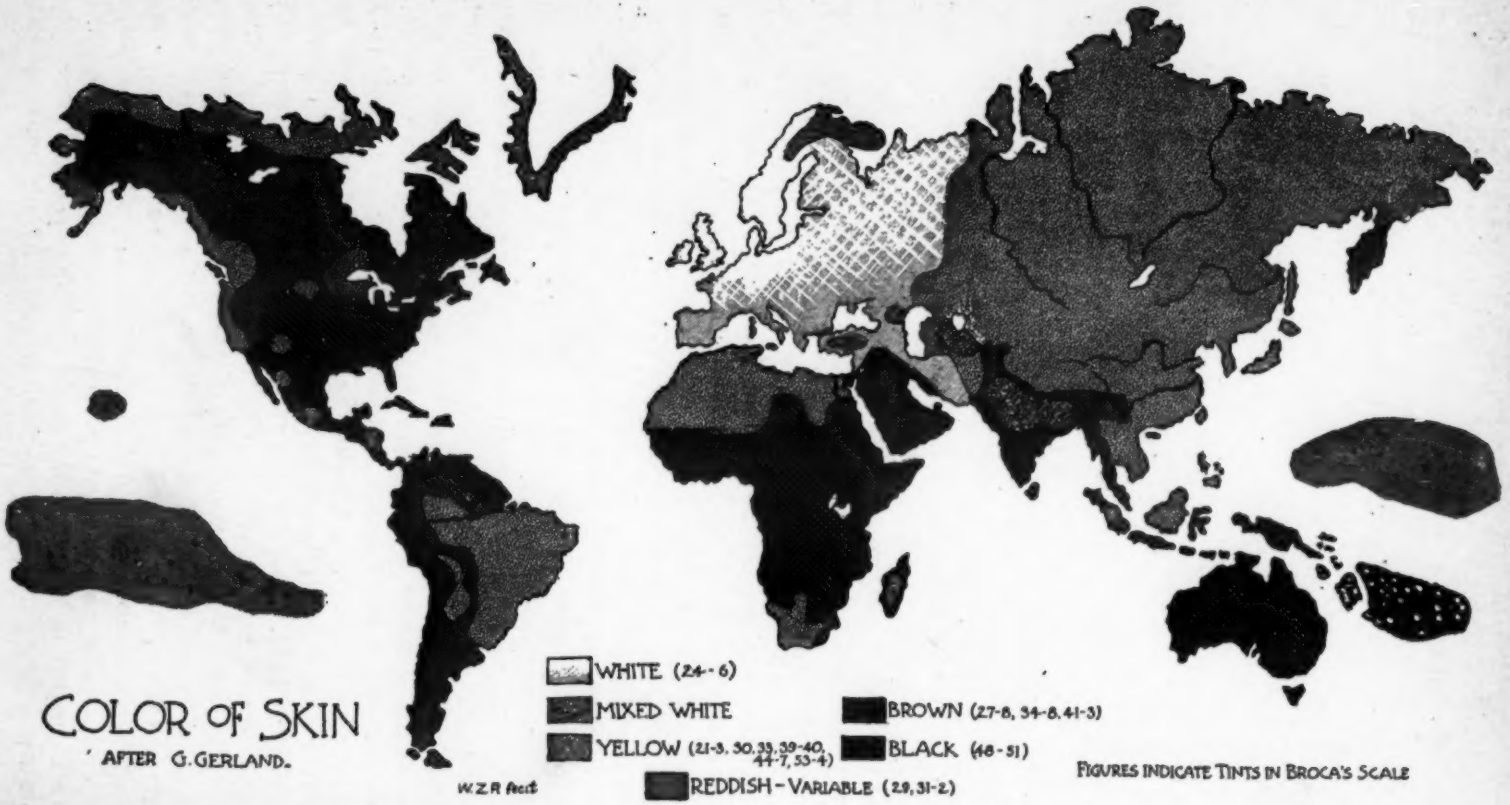
III.—BLONDES AND BRUNETTES.

THE color of the skin has been from the earliest times regarded as a primary means of racial identification. The ancient Egyptians were accustomed to distinguish the races known to them by this means both upon their monuments and in their inscriptions. Notwithstanding this long acquaintance, the phenomenon of pigmentation remains to-day among the least understood departments of physical anthropology. One point alone seems to have been definitely proved: however marked the contrasts in color between the several varieties of the human species may be, there is no corresponding difference in anatomical structure discoverable.

Pigmentation arises from the deposition of coloring matter in a special series of cells, which lie just between the translucent outer skin or epidermis and the inner or true skin known as the cutis. It was long supposed that these pigment cells were peculiar to the dark-skinned races; but investigation has shown that the structure in all types is identical. The differences in color are due, not to the presence or absence of the cells themselves, but to variations in the amount of pigment therein deposited. In this respect, therefore, the negro differs physiologically, rather than anatomically, from the European or the Asiatic. Yet this trait, although superficial so to speak, is exceedingly persistent, even through considerable racial intermixture. The familiar legal test in our Southern States in the *ante-bellum* days for the determination of the legal status of octoroons was to look for the bit of color at the base of the finger nails. Under the transparent outer skin in this place the telltale pigmentation would remain, despite a long-continued infusion of white blood.

In respect of the color of the skin, we may roughly divide the human species into four groups indicated upon our world map.


COLOR OF SKIN
AFTER G. GERLAND.
WHITE (24-6)
MIXED WHITE
YELLOW (21-3, 30, 33, 39-40, 44-7, 53-4)
REDDISH - VARIABLE (29, 31-2)
BROWN (27-8, 34-8, 41-3)
BLACK (48-51)
FIGURES INDICATE TINTS IN BROCA'S SCALE
W.Z.R. del.

The jet or coal black color is not very widespread. It occurs in a narrow and more or less broken belt across Africa just south of the Sahara Desert, with a few scattering bits farther south on the same continent. Another center of dissemination of this characteristic, although widely separated from it, occurs in the islands southeast of New Guinea in the Pacific Ocean, in the district which is known from this dark color of its populations as Melanesia. Next succeeding this type in depth of color is the main body of negroes, of Australians, and of the aborigines of India. This second or brownish group in the above-named order shades off from deep chocolate through coffee-color down to olive and light or reddish brown. The American Indians fall within this class, because, while reddish in tinge, the skin has a strong brown undertone. In the Americas we find the color quite variable, ranging all the way from the dark Peruvians and the Mexicans to the aborigines north of the United States. The Polynesians are allied to this second group, characterized by a red-brown skin. A third class, in which the skin is of a yellow shade, covers most of Asia, the northern third of Africa, and Brazil, including a number of widely scattered peoples such as the Lapps, the Eskimos, the Hottentots and Bushmen of South Africa, together with most of the people of Malaysia. Among these the skin varies from a dull leather color, through a golden or buff to a muddy white. In all cases the shading is in no wise continuous or regular. Africa contains all three types of color from the black Dinkas to the yellow Hottentots. In Asia and the Americas all tints obtain except the jet black. There are all grades of transitional shading. Variations within the same tribe are not inconsiderable, so that no really sharp line of demarcation anywhere occurs.

The fourth color group which we have to study in this paper is alone highly concentrated in the geographical sense. It forms the so-called white race, although many of its members are almost brown and often yellow in skin color. As we shall show, its real determinant characteristic is, paradoxically, not primarily the skin but the pigmentation of the hair and eyes. Nevertheless, so far as it may be used in classification, the very light shades of skin are restricted to Europe, including perhaps part of modern Africa north of the Sahara, which geologically belongs to the northern continent. There is a narrow belt of rather light-skinned peoples running off to the southeast into Asia, including the Persians and some high-caste Hindus. This offshoot vanishes in the Ganges Valley in the prevailing dark skin of the aboriginal inhabitants of India. The only entirely isolated bit of very light skin elsewhere occurs among the Ainos in northern Japan; but these people are so few in number and so abnormal in other respects that

we are warranted in dismissing them from further consideration in this place.

Anthropologists have endeavored for a long time to find the cause of these differences in the color of the skin.* Some have asserted that they were the direct effects of heat; but our map shows that the American stock, for example, is in no wise affected by it. A consideration of all the races of the earth in general shows no correspondence whatever of the color of the skin with the isothermal lines. The Chinese are the same color at Singapore as at Pekin and at Kamchatka. Failing in this explanation, scientists have endeavored to connect pigmentation of the skin with humidity, or with heat and humidity combined; but in Africa, as we saw, the only really black negroes are in the dry region near the Sahara Desert, while the Congo basin, one of the most humid regions on the globe, is distinctly lighter in tint. Others have attempted to prove that this color, again, might be due to the influence of the tropical sun, or perhaps to oxygenation taking place under the stimulation of exposure to solar rays. This has at first sight a measure of probability, since the color which appears in tanning or freckles is not to be distinguished physiologically from the pigment which forms in the main body of the skin of the darker races. The objection to this hypothesis is that the covered portions of the body are equally dark with the exposed ones, and that certain groups of men whose lives are peculiarly sedentary, such as the Jews, who have spent much of their time for centuries within doors, are distinctly darker than other races whose occupations keep them continually in the open air. This holds true whether in the tropics or in the northern part of Europe. This local coloration in tanning, moreover, due to the direct influence of the sun is not hereditary, as far as we can determine. Sailors' children are not darker than those of the merchant, even after generations of men have followed the same profession. Each of these theories seems to fail as a sole explanation. The best working hypothesis is, nevertheless, that this coloration is due to the combined influences of a great number of factors of environment working through physiological processes, none of which can be isolated from the others. One point is certain, whatever the cause may be—that this characteristic has been very slowly acquired, and has to-day become exceedingly persistent in the several races.

Study of the color of the skin alone has nothing further to interest us in this inquiry than the very general conclusions we have just outlined. We are compelled to turn to an allied charac-

* Th. Waitz: Anthropologie der Naturvölker, vol. i, p. 55 *seq.*, contains some interesting remarks on this subject.

teristic—namely, the pigmentation of the hair and eyes—for more specific results. There are three reasons which compel us to take this action. In the first place, the coloration of the hair and eyes appears to be less directly open to disturbance from environmental influences than is the skin, and variations in shading may be at the same time more easily and delicately measured. Secondly, the color or, if you please, the absence of color, in the hair and eyes is more truly peculiar to the European race than is the lightness of its skin. There are many peoples in Europe who are darker skinned than certain tribes in Asia or the Americas; but there is none in which blondness of hair and eyes occurs to any considerable degree. It is in the flaxen hair and blue eye that the peculiarly European type comes to its fullest physical expression. This at once reveals the third inducement for us to focus our study upon these apparently subordinate traits. Europe alone of all the continents is divided against itself. We find blondness in all degrees of intensity scattered among a host of much darker types. A peculiar advantage is herein made manifest. Nowhere else in the world are two such distinct varieties of man in such intimate contact with one another. From the precise determination of their geographical distribution we may gain an insight into many interesting racial events in the past.

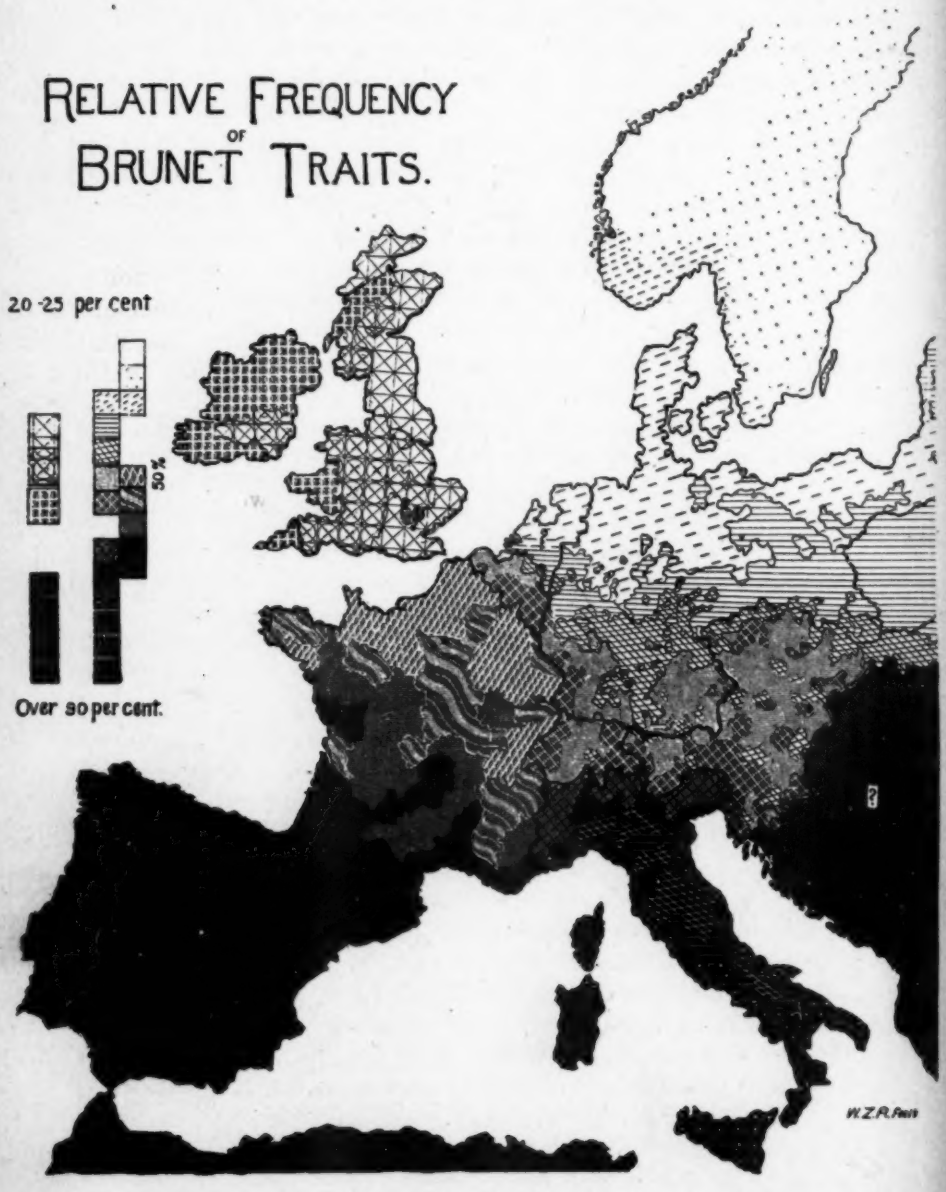
The first general interest in the pigmentation of the hair and eyes in Europe dates from 1865, although Dr. Beddoe began nearly ten years earlier to collect data from all over the continent. His untiring perseverance led him to take upward of one hundred thousand personal observations in twenty-five years. During our own civil war about a million recruits were examined in this respect, many of them being immigrants from all parts of Europe. The extent of the work which has been done since these first beginnings is indicated by the following approximate table:

Number of Observations.

	School children.		Adults.
Germany	6,758,000	Italy	299,000
Belgium	608,000	France	225,000±
Switzerland	497,000	British Isles:	
Austria	2,304,000	General	53,000
		Criminals, etc.	12,000
		United States	1,000,000
		Remainder of Europe	50,000±
	10,167,000		1,639,000

It thus appears that the material is ample in amount. The great difficulty in its interpretation lies in the diversity of the systems which have been adopted by different observers. It is not easy to give an adequate conception of the confusion which

prevails. Here are a few of the obstacles to be encountered. As the table indicates, the countries north of the Alps have been mainly studied through their school children. In the Latin half



of Europe adults alone are included. Secondly, it is a matter of common observation that flaxen hair and blue eyes are characteristic of childhood. As it has been proved that from ten to twenty per cent of such blond children at maturity develop darker hair

or eyes, the fallacy of direct comparison between the north and south of Europe again becomes apparent. In the third place, it is not easy to correct for the personal equation of different observers. A seeming brunette in Norway appears as quite blond in Italy because there is no fixed standard by which to judge. The natural impulse is to compare the individual with the general population round about. The precision of measurements upon the head is nowise attainable.

There are two principal modes of determining the pigmentation of a given population. One is to discover the proportion of so-called pure brunette *types*—that is to say, the percentage of individuals possessed of *both* dark eyes and hair. The other system is to study brunette *traits* without regard to their association in the same individual. This latter method is no respecter of persons. The population as a whole, and not the individual, is the unit. North of the Alps they have mapped the pigmentation in the main by types; in France, Norway, Italy, and the British Isles they have chosen to work by dissociated traits. Here again is a stumbling-block in the way of comparisons. The absolute figures for the same population gathered in these two ways will be widely different. Thus in Italy, while only about a quarter of the people are pure brunette types, nearly half of all the eyes and hair in the country are dark. That is to say, a large proportion of brunette traits are to-day found scattered broadcast without association one with another. In Europe, as a whole, upward of one half of the population is of a mixed type in this respect. In America the equilibrium is still further disturbed. Nor should we expect it to be otherwise. Intermixture, migration, the influences of environment, and chance variation have been long at work in Europe. The result has been to reduce the pure types, either of blonde or brunette, to an absolute minority. Fortunately for us, in despair at the prospect of reducing such variant systems to a common base, the results obtained all point in the same direction whichever mode of study is employed. In those populations where there is the greatest frequency of pure dark types there also is generally to be found the largest proportion of brunette traits lying about loose, so to speak. And where there are the highest percentages of these unattached traits, there is also the greatest prevalence of purely neutral tints, which are neither to be classed as blond or brunette. So that, as we have said, in whichever way the pigmentation is studied, the results in general are parallel, certainly at least so far as the deductions in this paper are concerned. Our map is indeed constructed in conformity with this assumption.*

* Dr. Livi, in his atlas to the superb Anthropometria Militare, has shown the parallelism very clearly in Charts VI to IX, inclusive. The method employed in reducing the

By reason of the difficulties above mentioned, our map is intended to convey an idea of the relative brunetteness of the various parts of Europe by means of the shading rather than by concrete percentages. It is, in fact, impossible to reduce all the results to a common base for exact comparison. What we have done is to patch together the maps for each country, adopting a scheme of tinting for each which shall represent, as nearly as may be, its relation to the rest. In the scale at the left the shades on the same horizontal line are supposed to represent approximately equal degrees of pigmentation. The arrangement of the colors in separate groups, it will be observed, corresponds to national systems of measurement. Thus the five tints used in Germanic countries and the six in Italy are separately grouped, and are each distinct from those used for the coloration of France. It will be observed that these separate national groups often overlap at each end. This arrangement indicates, for example, that the darkest part of Scandinavia contains about as many brunette traits as the lightest portion of Germany, and that they are both lighter than any part of Scotland; or that the fourth zone of brunetteness in Germany contains about as high a proportion of dark traits as the lightest part of France, and that they are both about as dark areas as the middle zone in England. As the diagram shows, central France is characterized by a grade of brunetteness somewhat intermediate between the south of Austria and northern Italy. In other words, the increase of pigmentation toward the south is somewhat more gradual there than in the eastern Alps. To summarize the whole system, equally dark tints along the same horizontal line in the diagram indicate that in the areas

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widely differing systems to a common base, so that comparisons may properly be drawn, is simple. In many areas along the border line of systems the same population has been studied from each side. Thus, in the Tyrol, Tappeiner (Zeit. für Ethnologie, xii, p. 269) has studied adults, so that his results may be correlated with those of Livi in Italy (Anthropometria Militare, Rome, 1896). At the same time Schimmer has studied the children (Mitt. der anth. Ges. in Wien, Supp., 1884), so that his data from the same people may bind them to the German-Austrian populations. Weisbach, from adults in Austria, also works near by (Mitt. der anth. Ges. Wien, xxv, p. 73). Dr. Beddoe, in his monumental work, The Races of Britain, with results of personal observation from all over Europe, gives data for international comparison, showing, for example, that southern England equals Alsace, and that Zurich equals London (p. 73, *seq.*). In another place he gives opportunity for comparison with the French system (Bull. de la Soc. d'Anth., Paris, 1882, p. 146; and Revue d'Anthopologie, Series III, iv, p. 513). Topinard (Eléments, pp. 338, 339), from the same observations, has shown that Normandy, Vienna, and Cornwall are about equally pigmented, and that the Walloons and the Bretons are about alike in this respect. Knowing from Vandekindere, Virchow (Archiv für Anth., xvi, p. 275), and Schimmer how the Walloons are related to the rest of central Europe, the way is clear. For Spain we have the merest hint from study of the eyes alone (Archiv für Anthropologie, xxii, p. 431). Weisbach (Zeitschrift für Ethnologie, Supplement, 1884) gives data for southeast Europe. In due time the further details of preparation for the map will be published.

thus equally shaded there are about the same proportions of traits or types, as the case may be, which are entitled to be called brunette.

In a rough way, the extremes in the distribution of the blond and brunette varieties within the population of Europe are as follows. At the northern limit we find that about one third of the people are pure blondes, characterized by light hair and blue eyes; about one tenth are pure brunettes; the remainder, over one half, being mixed with a tendency to blondness. On the other hand, in the south of Italy the pure blondes have almost entirely disappeared. About one half the population are pure brunettes, with deep brown or black hair, and eyes of a corresponding shade; and the other half is mixed, with a tendency to brunetteness.* The half-and-half line seems to lie about where it ought, not far from the Alps. Yet it does not follow the parallels of latitude. A circle, described with Copenhagen as a center, sweeping around near Vienna, across the middle of Switzerland, thence up through the British Isles, might serve roughly to indicate such a boundary. North of it blondness prevails, although always with an appreciable percentage of pure brunettes. South of it brunetteness finally dominates quite exclusively. It should not fail of note that toward the east there is a slight though constant increase of brunetteness along the same degrees of latitude and that the western portion of the British Isles is a northern outpost of the brunette type.

Thus we see at a glance that there is a gradual though constant increase in the proportion of dark eyes and hair from north to south. There are none of those sharp contrasts which appeared upon our map showing the distribution of the long and broad heads in Europe. On that map the extremes were separated by only half a continent in either direction from the Alps; whereas in this case the change from dark to light covers the whole extent of the continent. It is as if a blending wash had been spread over the map of head form, toning down all its sharp racial division lines. Some cause other than race has evidently exerted an influence upon all types of men alike, tending to obliterate their physical differences. It is not a question of Celt, Slav, or Teuton. It lies deeper than these. The Czechs in Bohemia are as much darker than the Poles to the north of them, both being Slavic; as the Bavarians exceed the Prussians

* For Scotland, *vide* Report of 1883 of the Anthropometric Committee of the British Association for the Advancement of Science, p. 10. Norway is examined in Revue d'Anthropologie, Series III, vol. iv, p. 293. For Italy, Dr. R. Livi (Anthropometria Militare, Atlas, Plates 6 and 7). Still farther south Dr. Collignon has studied Tunis in Étude sur l'Ethnographie de la Tunisie, Paris, 1887. See also Revue d'Anthropologie, Series III, vol. iii, p. 3 *seq.*

in the same respect, although the last two are both Germans. It would be unwarranted to maintain that any direct relation of climate to pigmentation has been proved. The facts point, nevertheless, strongly in that direction. We do not know in precisely what way the pigmental processes are affected. Probably other environmental factors are equally important with climate. To that point we shall return in a few pages. We may rest assured at this writing that our map for Europe corroborates in a general way testimony drawn from other parts of the earth that some relation between the two exists.

It seems to be true that brunetteness holds its own more persistently over the whole of Europe than the lighter characteristics. Probably one reason why this appears to be so is because the dark traits are more striking, and hence are more apt to be observed. Yet, after making all due allowance for this fact, the relative persistency, or perhaps we might say penetrativeness, of the brunette traits seems to be indicated. Our map shows that, while in Scandinavia seldom less than one quarter of all the eyes and hair are dark, in the south the blond traits often fall below ten per cent of the total. Thus in Sardinia there are only about three per cent of all the eyes and hair which are light. The same point is shown with added force if we study the distribution of the pure blond or brunette types, and not of these traits independently. In the blondest part of Germany there are seldom less than seven per cent of pure brunette children. Among adults this would probably not represent less than fifteen per cent of pure brunettes, to say the least. As our table shows, in Scotland direct observations on adults indicate nearly a quarter of the population to be pure brunettes. On the other hand, the pure blondes become a negligible quantity long before we reach the

Percentage of—

	PURE BRUNETTES.		PURE BLONDES.	
	Children.	Adults.	Children.	Adults.
North Germany	7–11	..	33–44	..
Middle Germany	12–15	..	25–32	..
South Germany	15–25	..	18–24	..
Scotland	.....	22	.....	50
Ireland	.....	23	.....	48
Wales	.....	27	.....	34
Belgium	.....	27	.....	..
England	.....	31	.....	40
Switzerland	26	..	11	36
Austria	23	18	20	18
Italy	.....	25	.....	3
Sardinia	.....	49	.....	0·5
Croatia	.....	57	.....	..
Greece	.....	96	.....	..

bottom of the table at the south. Thus, among two thousand and fifty natives of Tunis in North Africa, true Europeans as we must repeat, Dr. Collignon found that, while blond hair or eyes were noticeable at times, in no single case was a pure blonde with both light hair and eyes to be discovered. Similarly, in Sardinia, less than one per cent of the population was found by Dr. Livi to be of this pure blond type. The interest and significance of this undoubted fact lie in its bearing upon the theory, propounded by Dr. Brinton, that northern Africa was the center of dispersion of the blond invaders of Europe, who introduced a large measure of its culture. The same thesis is upheld in the latest comprehensive work in anthropology: I refer to Keane's Ethnology. We shall return to this theory at a later time. It is sufficient here to notice how completely this blond type vanishes among the populations of the south of Europe and northern Africa to-day. Such blondes do occur. Each one in so dark a general population as here prevails is a host itself in the observer's mind. The true status is revealed only when we consider men by hundreds or even thousands.

Thus far we have been mainly concerned with the pigmentation of the hair and eyes as a result of climatic or other environmental influences. Let us now consider the *racial aspect* of the question. Is there anything in our map which might lead us to suspect that certain of these gradations of pigmentation are due to purely hereditary causes? In other words, do the long heads and the short heads differ from one another in respect of the color of the hair and eyes, as well as in cephalic index? In the preceding paper we took occasion to point out in a general way the remarkable localization of the round-headed element of the European population in the Alps. The great central highland seemed indeed to constitute a veritable focus of this peculiar physical type. In this way it divided two similar centers of long-headedness—Teutonic in the north, Mediterranean in the south—one from another. This geographical characterization of the broad-headed variety entitled it, in our opinion, to be called the Alpine type, in distinction from the two others above mentioned. It will now be our purpose to inquire whether or not the physical traits of pigmentation stand in any definite and permanent relation to the three types of head form we have thus separated from one another in the geographical sense.

Many peculiarities in our color map point to the persistence of racial differences despite considerable similarity of environment. Thus the Walloons in the southeastern half of Belgium, with a strip of population down along the Franco-German frontier, are certainly darker than the people all about. Among these Wal-

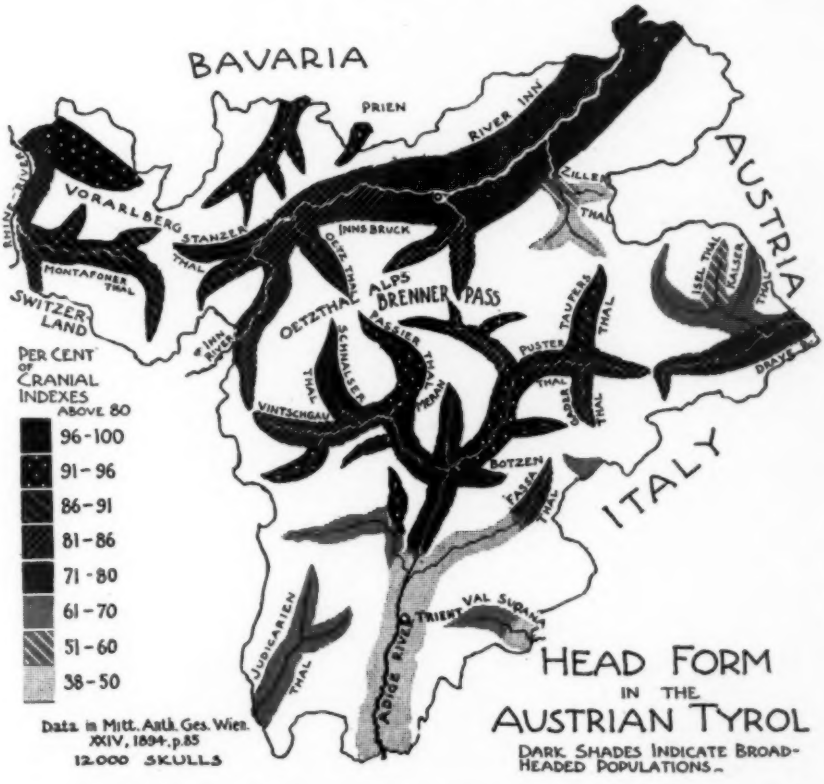
loons brunette traits are upward of a third more frequent than among the Flemish in northern Belgium. This is especially marked by the prevalence of dark hair in the hilly country south of Brussels. The British Isles offer another example of local differences in this respect which can not be ascribed to environment. Wales and Ireland, Cornwall and part of Scotland are appreciably brunette, as compared with other regions near by. The contrast between Normandy and Brittany in France is of even greater value to us in this connection. Dark hair is more than twice as common in the Breton cantons as it is along the English Channel in Normandy. These differences can not be due to the Gulf Stream mildness of the western climate or to the physical environment in any other way. If we may judge from our scanty data for Spain, another racial break occurs here as well, which seems to justify the statement that "beyond the Pyrenees begins Africa." In the other direction, among the Hungarians, we begin to scent an Asiatic influence in the dark population of the southeast of Europe.

Perhaps the most conspicuous example of the racial fixity of this trait of pigmentation is offered by the Jews. They have preserved their Semitic brunetteness through all adversities. Socially ostracized and isolated, they have kept this coloration despite all migrations and changes of climate. In Germany to-day forty-two per cent of them are pure brunettes in a population containing only fourteen per cent of the dark type on the average. They are thus darker by thirty per cent than their Gentile neighbors. As one goes south this difference tends to disappear. In Austria they are less than ten per cent darker than the general population; and finally in the extreme south they are even lighter than the populations about them. This is especially true of the red-haired type common in the East. To discover such differences requires minute examination. The reward has been to prove that pigmentation in spite of climate is indeed a fixed racial characteristic among the people of Europe. We are therefore encouraged to hope that great racial groups of population may still yield us evidence of their relationship or lack of it in this respect, as well as in the head form.

It will be necessary, before considering this matter further, for us to turn aside for a moment to study the population of central Europe a little more in detail than we have thus far been able to do. We shall attempt to prove a point of great significance. The broad-headed type not only forms the bulk of the present population of the Alpine highlands. This was established in the preceding paper. We have now to prove that it at the same time is clearly the oldest or most primitive element among the inhabitants of this region; that it lies so near the soil that the racial

character of the population of the Alps varies in direct relation with the physical geography of the country.

The Austrian Tyrol is one of the most favored spots in Europe for the study of the order and succession of the long and the broad heads respectively. It is the geographical center of the continent. It holds strategically the great highway of communication—the Brenner Pass—between the north and the south of Europe. As our map shows, it is also the crest of the great European



watershed. From it flow the Inn River and the Drave into the Danube, thence to the Baltic Sea on the east; the Adige is an affluent of the Po, running due south to the Adriatic; and on the west the branches of the Rhine carry its waters into the Atlantic. Each of these great river systems has marked a line of human immigration and has directed racial movement to this spot. By the Danube the Slavs have come, and by Innsbruck, over the Brenner, the Teutons have passed across into the valley of the Adige and thence directly into the plain of Italy. Back over the same route have flowed many phases of Mediterranean culture into the north from the time of the Phœnicians to the present. The Tyrol, for these reasons, is the one spot in Europe in which racial

competition has come to a focus. The population is exceedingly mixed. I have seen men of the purest Italian type speaking the German tongue; and at Botzen blond Teutons who made use of good Italian. Despite this circumstance of racial intermixture, there are within the Tyrol at the same time a number of areas of isolation which possess very marked individuality. We thus have the sharpest contrasts between mixed and pure populations. The Oetztal Alps, in the very center of the country, are as inaccessible as any part of Europe. So rugged is this latter district that the dialects differ from valley to valley, and the customs and social institutions as well.

Turning now to the anthropological map of this region, based upon a measurement of over twelve thousand skulls, it will be found that in nearly every case the broad heads become numerous in direct proportion to the increase in altitude. In other words, the broad open valleys leading out toward the great river systems of Europe are relatively dolichocephalic; while the side branches in the Oetztal Alps, isolated from foreign influences, show a marked preponderance of round-headedness. Thus in the Stanzerthal and the valley of the Schnals, indicated upon our map by the solid black tint, are two of the broadest-headed spots in the world. Over seventy per cent of all the heads measured from these two districts had indices above 85. These both lie, it will be observed, well off the main line of travel, either by the Inn Valley or over the Brenner. At their outlets they contain many heads of medium breadth, but these become less frequent as we penetrate the highlands. Like them are nearly all the side valleys in this part of the Alps. So closely, indeed, does this physical trait follow the topography that Ranke of Munich, as we have already said, has endeavored to connect the broad-headedness and altitude as cause and effect. For us the true explanation of this phenomenon is entirely racial. It is a product of genuine social selection. The two great branches of narrow-headedness, the blond Teuton at the north and the Mediterranean at the south with dark eyes and hair, have invaded the Alps all the way from France to the Balkan states. At the time of their coming a broad-headed population, as it would appear, occupied the whole mountain chain. The result is that to-day its main peculiarity has become attenuated exactly in proportion to the degree to which it has been exposed to racial intermixture with the newcomers.

Here is an example, then, of purely human stratification. The Alpine type has been overlaid by the newcomers, or else has been gradually driven up and back into the areas of isolation. Those who remained along the great routes of travel have been swamped in a flood of foreign intermixture. The only exceptions to the

rule we have observed of a primitive broad-headed layer of population isolated in the uplands are offered by the two valleys of the Ziller in the northeast and of the Isel and Kalserthals just across the main chain of the Alps by Linz. In these places the converse of our proposition is true, since, as one ascends the valleys the broad heads become less frequent. No explanation for this has been offered; but I have a suspicion that it points to still a third layer of population. The Slavic peoples immigrating within the historic period are all very broad-headed. It is not impossible that this racial element which has overlaid the Teutons in parts of eastern Europe may have followed them into these valleys. Certain it is that Slavic skulls begin to occur in this region. It may have happened in this way: When the long-headed Teutons came, they drove the primitive Alpine population into the side valleys. Then, when the Slavs followed the Teutons, these latter types drifted up and back as well, merging with the original broad-headed stock to produce an intermediate type of head form. This would obviously be less broad than the new Slavic type in relative purity along the main channels of immigration.

The evidence from the Tyrol that in this part of the Alps the broad heads lie nearest the soil is sustained by similar testimony from the other end of the same mountain chain. Dr. Bedot has studied in some detail the population of the Valais—the valley of the upper Rhone in western Switzerland.* Here precisely as in the Tyrol the side valleys are distinctly broader-headed than that of the Rhone. Wherever the foreigner has come he has lowered the cephalic index. Thus, for example, in the open valley of the Rhone the average index is but 82, while in the Gorge du Trient, leading over toward Chamounix, it rises 87. Few of the villages investigated are as isolated to-day as those in the Oetztal valleys of the Tyrol; but in proportion as they lie off the main track the index rises appreciably. The evidence is indubitable that the broad-headed type is the oldest and most primitive all through the Alps.

The fact which we have just indicated—namely, that the racial type of the population of the Alpine areas changes with the character of the country—will now serve us as a foothold for another advance in our argument. By it we shall hope to prove that while the Alpine racial type is intermediate in the pigmentation of the hair and eyes between the Teutonic populations on the north and the Mediterranean at the south, at the same time this physical trait is open to profound modification by the direct influences of environment. We shall hope to prove directly what we have already inferred from consideration of our general map of Europe;

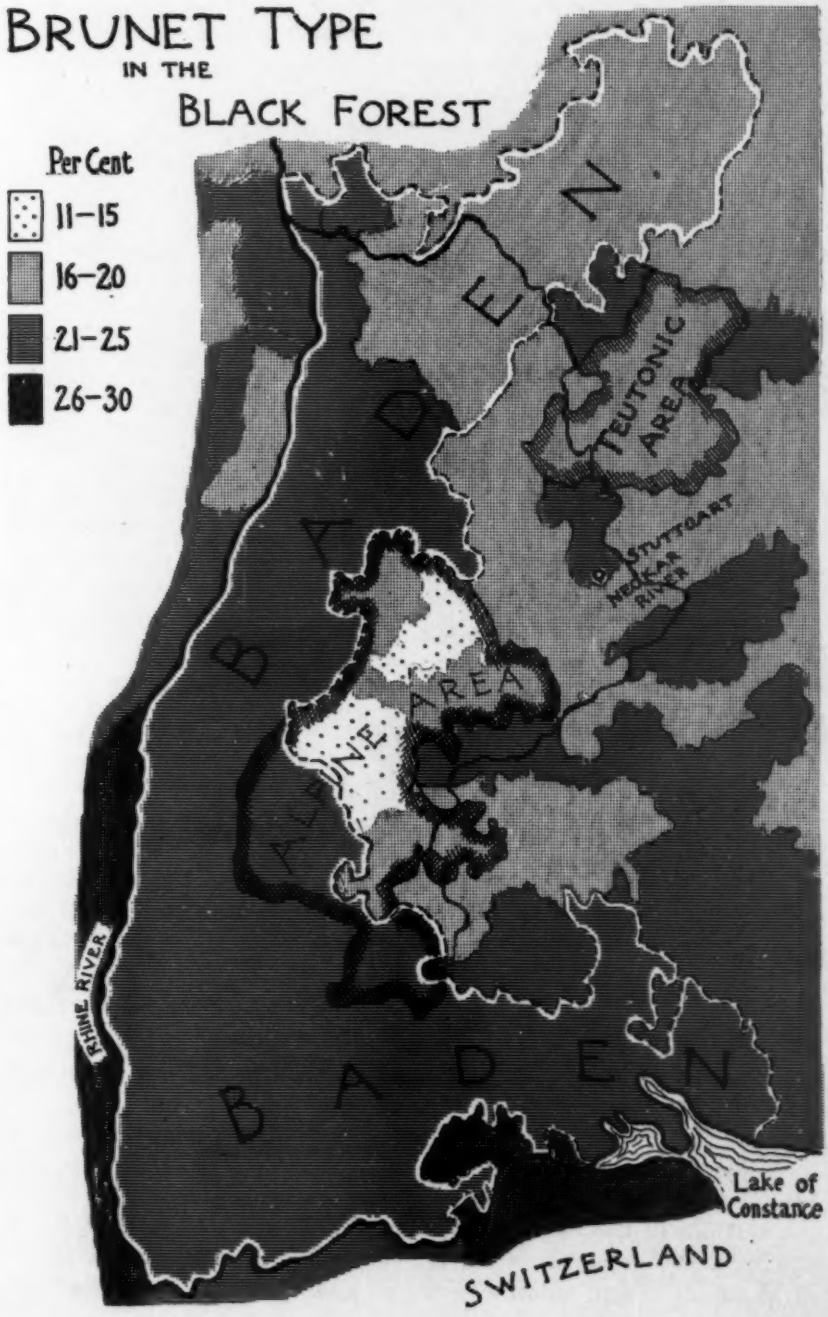
* Bull. Soc d'Anth., Paris, Series IV, vol. vi, p. 486 *seq.*

namely, that certain factors, either climate, economic status, or habits of life, are competent to produce appreciable changes in the color of the hair and eyes.

Since, at this point, we are venturing forth upon an uncharted sea, it behooves us to stop a moment and examine what store of argument we have on hand. Two theses we hope to have proved respecting those portions of central Europe which are characterized by the broad-headed Alpine type of population. The first is that this racial element being the most ancient, becomes relatively more frequent in the areas of isolation, where natural conditions have been least disturbed by immigrants. In the byways, the primitive inhabitant; in the highways, the marauding intruder! This principle is as old as the hills. It is certainly true of languages and customs, why not likewise of race? We shall be able to establish its verity for all parts of Europe in due time. It forms the groundwork of our socio-geographical theory. The second thesis, no less important, is that this primitive Alpine type of population normally tends to be darker in hair and eyes than the blue-eyed, flaxen-haired, and long-headed Teutonic peoples on the north; and that, on the other hand, by its grayish hazel eyes and brownish hair, this broad-headed type is to be distinguished from its more thoroughly brunette neighbor at the south. The geographical evidence afforded by our map of Europe all gives tenability to this view that the Alpine type is intermediate in the color of hair and eyes. It will serve as proof provisionally at least. In the next paper we shall discuss the matter of the association of separate traits into racial types from another point of view. We shall run up against some contradictory evidence, to be sure, but satisfactory disposition may be made of this when it appears. In the meantime we assume it to be geographically, if not indeed as yet anthropologically, proved beyond question.

What deduction is to be made from these two theses we have just outlined? The third side of our logical triangle seems to be fixed. If the areas of isolation are essentially Alpine by race, and if this ethnic type be truly intermediate in pigmentation, the byways, nooks, and corners of central Europe ought normally to be more brunette than the highways and open places all along the northern Teutonic border. Contrariwise, toward the south the indigenous undisturbed Alpine populations ought to be lighter than the heterogeneous ones, infused with Mediterranean brunette blood, if we may use the term. Since mountainous areas are less exposed to racial contagion by virtue of their infertility and unattractiveness as well as by their inaccessibility or remoteness from dense centers of population, we may express our logical inference in another way. Where the Teutonic and the Alpine racial types are in contact geographically the population of

mountainous or isolated areas ought normally to contain more brunettes than the people of the plains and river valleys, since blond traits have had lesser chance of immigration. The opposite



rule would obtain south of the Alps. If this relation does not hold, there must obviously be something environmentally the matter. Let us examine the facts.

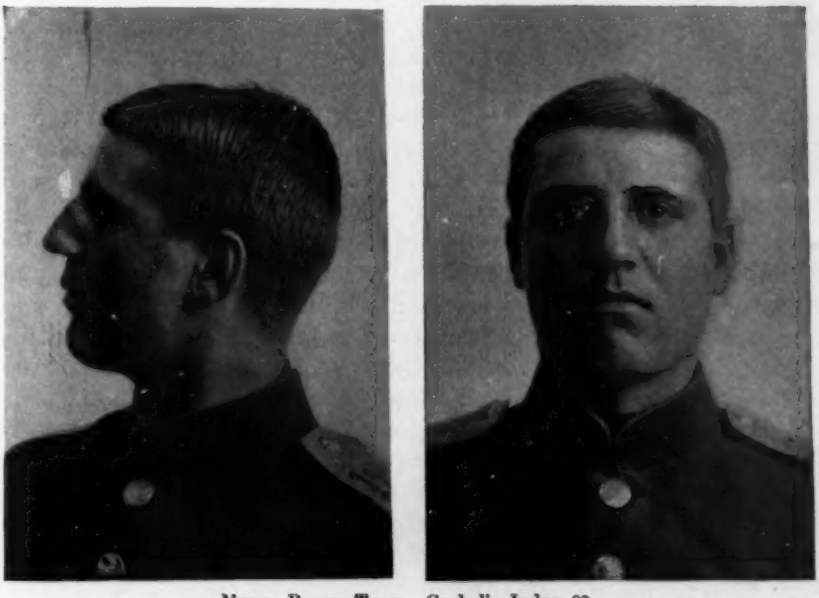
The Black Forest in southwestern Germany affords us a good opportunity for the comparison of relatively pure and mixed

PURE BLOND TEUTONIC TYPE. Cephalic Index, 75.

populations. This mountainous, heavily wooded district, shown in our map, lies close by the upper courses of the two principal rivers of Europe, which have both formed great channels of racial migration. The Rhine encircles it on the west and south, and an important affluent of the same river bounds it on the east; for the Neckar drains the fertile plains of Würtemberg, or Swabia, which lie about Stuttgart. This capital city, it should be observed, lies not far from the point of that blond Teutonic wedge which, we have already shown, penetrates central Europe from the north. Finally, the Danube, not shown upon the map, takes its source in the southeastern part of the Forest, and has therefore opened up still another route of racial immigration from this quarter.

There is every evidence that here in the Black Forest is a mountainous area of isolation containing a people which is distinctly Alpine in type of head form as compared with the mixed populations of the fertile plains and valleys round about it. For example, the cephalic index in Wolfach in its center is above 86, three units and more above the average for the Rhine Val-

ley communes.* This difference is almost appreciable to the eye; it may be approximately shown by the three portraits in our text. The first one represents a pure Teutonic blond type with the relatively narrow head and long face characteristic of the race of northern Europe. The second is the average type found in Baden, probably about half Teutonic and half Alpine by race. The breadth of the head compared with its length as well as the roundness of the face appear to be well marked. It should be added that it was characterized by brown hair and blue eyes. The third portrait, unfortunately not of a native of the most retired upland of the Forest, is nevertheless fairly typical of the extreme breadth of head form which there prevails. In this particular case the face is rather long for the breadth of the head, a combination not uncommon in southern Germany. For reasons given in the preceding paper, this facial feature may be regarded as less important than the proportions of the cranium itself. Judged by this latter standard, there is every indication that the Black Forest



MIXED BADEN TYPE. Cephalic Index, 83.

contains the broad-headed Alpine type in comparative purity. Dr. Ammon, of Baden, has very kindly placed his unpublished data at my disposition. These have been suitably mapped † by com-

* Dr. Otto Ammon, in Sammlung gemeinverständlicher wissenschaftliche Vorträge, neue Folge, Series V, Heft 101.

† Certain statistical liberties have been taken with this map. For instance, it has been assumed that in the long and narrow administrative districts, extending from the Rhine

munes, proving that in so far as Baden itself is concerned there is no doubt about the increased broad-headedness as one penetrates the innermost recesses of the Schwarzwald.

For Würtemberg and the Neckar Valley we have no modern researches upon living men to offer as evidence. In place of it we possess results obtained upward of thirty years ago from a study of the crania of modern populations.* At that time von Hölder discovered the existence of two distinct types of head form in the population of Swabia, and he found them severally clustering about the two "areas" outlined upon the map. In the northern one, lying just outside the old Roman wall which cut diagonally across the map from the southeast not far from Stuttgart, he found traces of a long-headed population, deemed by him typical of the barbarians of Germany. Within the "Limes Romanus" were mixed populations infused with Roman characteristics, but pointing to an isolated center of broad-headedness. This is shown by the "Alpine area." It will be observed at once that these results for Würtemberg and Baden are a check upon one another, despite the fact that the two researches were made over thirty years apart—one upon skulls, the other upon living men. That in this Black Forest area of isolation we have to do with an island of the Alpine type is also rendered more probable by the relative shortness of its people. Our next paper will deal with bodily stature as an ethnic trait. We may here anticipate enough to assert that a tall stature is one of the most constant characteristics of the Teutonic type. The Alpine race is distinctly shorter. Therefore this third physical trait helps to confirm us in our deduction.

ALPINE TYPE. Cephalic Index, 87±.

clear across to the eastern frontier of Baden, the eastern or upland half was as much broader-headed than the western Rhine half as separate districts lying along the east were above others along the Rhine. In such cases the technical averages have been split up into two others conforming in general with the averages for those districts which really follow the topographical features of the country.

* Dr. von Hölder, in Archiv für Anthropologie, vol. ii, p. 50. The indicated "Alpine" and "Teutonic Areas" are mapped from his enumeration of the communes in which he asserted the several types to be most prevalent. As such the results can not be more than roughly approximate. That they accord so fully with the data for Baden gives hope that the true conditions are represented.

Probability is rendered certainty by corroborative evidence from a large part of Europe that the Alpine type for some reason always takes to the woods and hills when in competition with the Teutonic race. We shall be able to show it in detail for France, Germany, Austria, and elsewhere, as we have already done for the Tyrol. Just across the Rhine in the Vosges it is true, and in Belgium it determines the division line of Walloons from Flemings. We may accept the law as proved beyond reasonable doubt.

This population of the inner Black Forest being Alpine, ought racially to be dark in the color of the hair and eyes. Nevertheless, the evidence all goes to show that, instead of being darker, it really manifests a distinct tendency toward blondness. Here, again, we are able to draw proof from two separate sources which serve as a check upon one another. The ground tints upon our map represent the percentage of pure blondes among the school children, as gathered in the great census conducted by Virchow. They show that a considerable part of the "Alpine area," measuring the head form, contains an abormal number of blond children. For example, forty-two hundred children in this Alpine area comprised but fifteen per cent of blond types, as compared with an average of nearly twenty-five per cent in the Rhine and Neckar Valleys. For Baden, however, the blondness of the upland interior region does not appear upon this map. Fortunately, we possess detailed results for this side of even greater value, since Dr. Ammon has studied the adult population. He asserts that there is a regularly increasing blondness toward the center of the Forest.* Why did this not appear among the thousands of school children in Baden studied by Virchow? To venture a rash hypothesis, may it not have been because the influences of environment had not had time to produce their effects so strongly in childhood, and that they appeared in accentuated form at a later period of life? Before we proceed to discuss the exact cause of this surprising reversal of racial characteristics, let us consider one other example of a similar character.

Some years ago Dr. Studer conducted a great investigation upon the color of the hair and eyes of some ninety-four thousand school children in the canton of Berne, in Switzerland.† As a result he discovered another one of these confusing phenomena of racial improbabilities. It appeared that here also there was an appreciable tendency toward blondness in the high Alps, racial tendencies to the contrary notwithstanding. Topographically,

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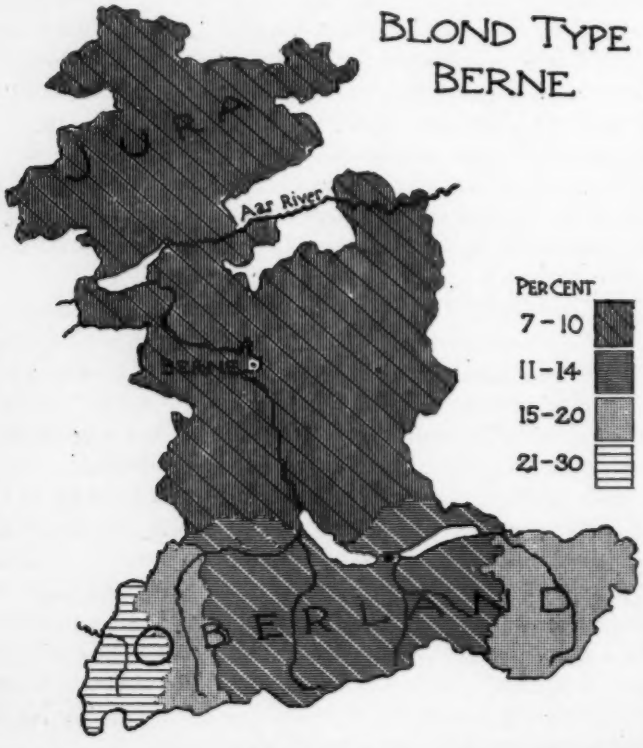
* For example, Wolfach, in the southern part of the "Alpine area," with the broadest heads in Baden, contains thirty-one per cent of blondes among adults. Ammon, *op. cit.* In this commune sixty-four per cent of the cephalic indices were above 85.

† Mittheilungen der Naturforschenden Gesellschaft in Bern, 1880, Heft 979, p. 54 *seq.*

the canton of Berne extends over three regions quite distinct in character. A middle strip along the valley of the Aar as far as the city of Berne consists of an elevated, not infertile table-land, with a rolling, hilly surface. This becomes gradually more rugged, until it terminates in the high mountains of the Bernese Oberland south of Interlaken. Here in this chain we have the most elevated portion of Switzerland; and, we may add, one of the most unpropitious for agriculture or industry. The peasants hereabouts must live upon the tourist or not at all. The north-



ern third of Berne covers the Jura Mountains, quite high, but of such geological formation that the soil yields not ungraciously to agriculture. Thus from the economic point of view we may divide the canton into two parts, setting aside the southern third—the Oberland—as decidedly inferior to the rest. The people of this region in the ante-tourist era could not but be unfavorably affected by their material environment.

Our map shows that this economic contrast is duplicated in the anthropological sense by a considerable increase of blondness within the Oberland, which becomes more marked as the fastnesses of the mountains are approached. North of the city of Berne there are from seven to eleven per cent of pure blondes; in

the Oberland sometimes upward of three times as many. Is it possible that this blondness in the mountains may be due to race? If so, it must be Teutonic. Our map of Europe shows that Switzerland is cut in halves at just this point by an intrusive strip of northern blondness. Dr. Studer explained it on the assumption that this blondness migrating to the south along the Rhine, and then up the Aar, had heaped itself up, so to speak, against this great geographical barrier. This supposition might be tenable were not the evidence of the head form for all Europe flatly opposed to it. There is nothing to show that the law of segregation of the Alpine type in the areas of isolation does not hold here as in the Tyrol, in western Switzerland, and the Black Forest. Central Switzerland was historically overrun by the Helvetians, who have been identified as Teutonic by race. The Rhætians were the more primitive Alpine type. Every principle of human nature and ethnology opposes the supposition that these conquering Helvetians would be content to leave the darker Rhætians in full possession of the fertile plain of the Aar while they betook themselves to the barren valleys of the Oberland. Everywhere else in Europe the rule is, "To the conqueror belong the plains, to the vanquished the hills." The blondness of the Oberland must therefore be regarded as racially anomalous. Another explanation for it must be found in the influence of environment.

Our final example, tending to prove that in mountainous areas of isolation some cause is at work which tends to disturb racial equilibrium in the color of the hair and eyes, is drawn from Dr. Livi's monumental treatise on the anthropology of Italy. In entire independence of my own inferences, he arrived at an identical conclusion that blondness somehow is favored by a mountainous environment. From a study of three hundred thousand recruits he found that fourteen out of the sixteen *compartimenti* into which Italy is divided conformed to this law. There was generally from four to five per cent more blondness above the four-hundred-metre line of elevation than below it.* The true significance of these figures is greater than at first appears, for we have again to consider the contrasts in the light of racial probability. In northern Italy the mountains ought to be lighter than the plains, because the Alps are here as elsewhere a stronghold of a racial type relatively blond as compared with the Mediterranean

* Anthropometria Militare, p. 63 *seq.* A review of this work is given by the author in Publications of the American Statistical Association, vol. v, pp. 38 and 101 *seq.* This law is shown by study of provinces also. There are sixty-nine of these available for comparison. Twelve of these contain no mountains; thirty-two show manifestly greater blondness in both hair and eyes; fifteen show it partially; in two, mountain and plain are equal; and in the remaining seven the law is reversed. Several of these latter are explainable by local disturbances.

brunettes. Environment and race here join hands to produce greater blondness in the mountains. It is in the south of Italy that the two work in opposition, and here we turn for test of our law. In the south the mountains should contain the Mediterranean brunette type in relatively undisturbed purity, for the northern blondes are more frequent in the attractive districts open to immigration. Even here in many cases this racial probability is reversed or equalized by some cause which works in opposition to race, so that we find comfort at every turn.

The law which we have sought to prove is not radically new. Many years ago Waitz asserted that mountaineers tended to be lighter in color of skin than the people of the plains,* educing some interesting evidence to that effect from the study of primitive peoples. He held that the true cause lay in the modifying influences of climate. Much of the data which we have here collected does not prove this. In fact, climatic changes can not be related to some of the variations in blondness which have been outlined. It seems as if some other factor had been at work. Dr. Livi ascribes the blondness of mountain peoples rather to the unfavorable economic environment, to the poor food, unsanitary dwellings, and general poverty of such populations. This explanation fits neatly into our social theory: for we assert that the population of mountains is relatively pure because there is no incentive for immigration of other types. Thus a pure population implies poverty of environment—a poverty which may stand in direct relation to the lack of pigmentation. It is yet too early to assert that this is the main cause. For the present it will suffice to have proved that appreciable differences in pigmentation exist, leaving the cause for future discussion. Much interesting material drawn from comparisons of urban with rural populations may help to throw light upon it. Our main purpose here has been to prove that pigmentation is a trait which is affected by environment. If, as we hope to have shown, the shape of the head is not open to such modification, we shall know where to turn when conflict of evidence arises. We shall pin our faith to that characteristic which pursues the even tenor of its racial way, unmoved by outward circumstances.

COMMENTING on the possibilities foreshadowed by the opening of the Niagara water power and foreseeing the extension of the principle to other cataracts, the London Spectator suggests that we shall perhaps ask in the future not "Has the country got coal?" but "Has it got waterfalls?"

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* Anthropologie der Naturvölker, vol. i, p. 49 *seq.*

REVERSIONS IN MODERN INDUSTRIAL LIFE.

By FRANKLIN SMITH.

PART FIRST.

IF the law of reversion holds true of physical life, it holds equally true of industrial life. Under its operation is revived the career of institutions as indicative of conditions long passed away as any deformity that may once have saved from extinction a race of brutes. However useful in the elevation of man from degradation and savagery, they contributed, after the completion of their purpose, no further service than one of evil. To many social reformers, the legislation in revival of the old trade and professional corporations, whose noble achievements fill one of the lighter pages of history, seems important and beneficent. But an error more alluring and dangerous was never current. Such legislation will not, as Herbert Spencer has often shown, further human welfare. On the contrary, it will undo the work of civilization, and renew the ravages of barbarism.

I.

When feudal corporations came into the world, there was an excuse for them. It was to prepare the way for modern industrial civilization. They found Europe in a state of anarchy. Every man's hand was against his neighbor's. War was almost the universal occupation. The men not engaged in robbery and slaughter were the menials—the serfs and slaves. It was in the midst of this disorder and carnage that the feudal corporations were born. The natural and spontaneous product of the times, and not of the wisdom of some philanthropist or statesman, they met the most urgent of needs—peace and security. "The workingmen's corporation and the commercial guild," says Pigeonneau, "were, first of all, an instrument of defense, a kind of mutual assurance against the violence, the exactions, or the negligence of the seignior and his representatives."* For these most unfortunate people, there was no police, no armed force for protection, no public security of any kind. They were plundered and murdered with impunity. For them there were no schools, no charities, no social organizations. Even religious privileges were denied them. Under the stress of threatened extermination, as well as the loss of all the blessings of life, the industrial classes, the most contemptible of human creatures, came together in powerful organizations for mutual aid and protection. "Individuals," says

* Histoire du Commerce de France. Par H. Pigeonnean, vol. i, p. 111. See Palgrave, Dictionary of Political Economy. Corporations, by Prof. J. K. Ingram, vol. i, p. 429.

Boehmert, "engaged in the same profession formed associations for the protection of their person, their families, and their property; for the creation of an internal moral and economic police, and particularly to punish associates who, by cheating in the quality of their products, could injure the reputation of the whole city; to watch over the completion of a regular apprenticeship, and to exercise a moral censorship over apprentices and journeymen; to take care of the widows, the orphans, the aged, and the infirm among them; to join together in the parish and to have masses said over the dead; to furnish a contingent of arquebusiers to the troops of the city, and, in general, to satisfy all social wants." *

Even when Étienne Boyleau, the famous provost of Paris under St. Louis and the author of the still more famous *Livre des Métiers*, gave these corporations a legal status, there was still an excuse. He was a warrior, with a warrior's love of discipline and system; he was a magistrate, with a magistrate's hatred of all kinds of lawlessness and dishonesty; he was a tax reformer, with tax reformer's eye to new sources of revenue for the impoverished treasury of a crusading monarch. "He re-established discipline in commerce, and in the arts and trades," says a writer in the *Biographie Universelle*, "in the collection of the royal taxes within his jurisdiction, and fixed those of the seigniorial courts included in his provostship; he moderated and fixed the imposts that were raised arbitrarily, under the provost farmers, on commerce and merchandise; he arranged all the traders and all the artisans in different bodies and communities under the title of brotherhoods; it was he that gave these corporations their first status for disciplinary purposes, and established the rules for the encouragement of honesty and commerce." † But there is reason to believe that the chief purposes of this feudal reformer were police and fiscal. "The kings," says Depping, "made successful use of the corporations for the collections of imposts, then very imperfectly done. When the artisans and traders were formed into a body, it sufficed to summon the head men and to charge them with the collection of the taille for each trade. . . . It became easier to designate the persons that should keep watch during the night, a forced labor that displeased the Parisians very much, and from which they sought as much as possible to escape." ‡

It is an inevitable tendency of all organizations, whatever be their purpose, be it political or industrial, to consolidate and

* Dictionnaire général de la Politique. Par M. Maurice Block. See Corporations, by V. Boehmert, vol. i, p. 537.

† Vol. v, p. 436.

‡ Règlemens sur les Arts et Métiers de Paris. Avec Notes et une Introduction. Par G.-B. Depping, p. lxxxiv. See also Palgrave, Dictionary of Political Economy, pp. 430, 431.

strengthen their power.* As long as the corporations of the arts and trades remained voluntary organizations, meeting wants that could be provided for in no other way, they played an important and indispensable part in the machinery of feudal society. It was in the interest of order and industry that they established monopolies, collected fees and dues, and sold privileges. With the money thus obtained, they protected life and property, promoted trade and commerce by the construction and maintenance of land and river routes,† and provided for the social wants of their members. But when they fell into the hands of the Government they were doomed. The vicious traits inherent in all organizations received a new impulse under the protection of the law, and eventually converted them into an intolerable evil. "Each corporation," says Depping, after telling how the interests of the public were ignored, "had in view only the personal advantage of the masters of the trade. The result was long apprenticeships, . . . heavy fines imposed on the apprentices, efforts to exclude from the markets of Paris the unauthorized traders and artisans, special privileges demanded by the industries devoted to the production of luxuries, restriction put upon emulation and competition, and finally a mechanical uniformity in manufacture." ‡

Even in the time of Philippe le Bel these evils were recognized, and an effort was made by that prince to remedy them. Many of the privileges of the corporations were abolished, the most notable being the permission granted to the Parisians to bake their own bread.* But the poison of monopoly had entered too deeply into the industrial system of the age to be eradicated so easily. The constant effort of the monopolists was to increase their monopoly; the constant effort of the Government was to exploit it—to convert it into a gold mine for the tax gatherers and an asylum for the office seekers. Enormous initiation fees were charged. In Paris they reached the incredible sum of a thousand livres; in the lesser cities they were five hundred.‖ It became impossible in some places in Germany to gain admission to the corporations except through marriage with the daughter or the widow of a master.△ The terms of apprenticeship and journeymanship were prolonged beyond all rational limit. The French coopers had to serve seven years, and the hatmakers ten years. If a man served an apprenticeship in Rouen and moved to Paris, he had to serve another.◊ Tests of fitness for admission, like the production of a

* See the striking example given by Depping, p. xxxii. † Pigeonneau, vol. i, p. 117.
‡ Règlemens sur les Arts et Métiers, p. lxxxiii. * Ibid., lxxxiv.
‖ Boehmert. Block's Dictionnaire général de la Politique, vol. i, p. 538.
△ Palgrave. Dictionary of Political Economy, vol. i, p. 431.
◊ Blanqui. History of Political Economy, p. 185.

masterpiece, made under rules that either hampered or destroyed all skill and originality, were rigorously applied. To draw the cords of monopoly still more tightly, rites and ceremonies were invented, the aid and protection of saints invoked, and emblems, banners, badges, and distinctive costumes to mark off each art and trade designed and adopted.

The moral havoc wrought by these monopolies was greater even than the industrial havoc. It crushed all feelings of justice and humanity, making its victims more grasping and cruel than Shylock; it led them to the practice of every trick and deception of a Newgate sharper to evade the laws; it stirred up a contention that rivaled the quarrels of the Guelphs and Ghibellines. Apprentices became no better than serfs and slaves. They were not merely pitilessly fined and brutally punished; they were often left in ignorance of the craft that they had purchased the right to learn. In that frightful social and moral revulsion following the long and devastating wars of the sixteenth and seventeenth centuries, the corporations became more determined than ever to maintain their industrial aristocracy and monopoly. They refused to admit any trade less ancient and honorable than their own, to the rights and privileges of the law; they soiled themselves by contact with no person of illegitimate birth; and in their savage and relentless pursuit of persons engaged in unauthorized traffic they invaded the homes of contraband workmen, confiscating both their tools and the hidden products of their toil, leaving them and their families destitute and starving.* To such absurd lengths was the creation of corporations carried for the production of new taxes and new places for court favorites that occupations like the teaching of dancing, the selling of flowers, and the catching of birds were organized, and homogeneous occupations like the hatmakers' and carpenters' were divided and subdivided beyond the comprehension of the modern mind. But despite the ingenuity of lawyers and the vigilance of armies of inspectors, the lines of demarcation could not be drawn so sharply as to avoid conflicts of interests. The makers of felt hats quarreled with the makers of cotton hats. The spinners who had purchased the right to use hemp quarreled with those that had purchased the right to use flax. The shoemakers fought with the cobblers that reproduced more than two thirds of an old shoe. The cutlers that made the handles of knives fought with those that made the blades. The relations of the makers of wooden porringers and the makers of wooden spoons were equally belligerent. Blanqui says that in the middle of the seventeenth century the annual cost of litigation over these inevitable inva-

* Boehmert. Block's Dictionnaire général de la Politique, vol. i, pp. 537, 538.

sions of industrial territory amounted in Paris alone to more than five hundred thousand francs; that the money wasted upon the suits of comparatively small corporations amounted to twenty-five thousand. "From St. Louis to Louis XIV," he says further in a striking summary of the fate that befell them, "there was not a sovereign who did not impose restrictions, taxes, and new regulations upon them; the courts overpowered them with judgment and fines without diminishing their ardor or calming their hatreds." * Founded to establish order and to fulfill a mission of mercy, they degenerated into engines of oppression, confusion, and degradation, giving birth, in a word, to all the evils of a society in a state of dissolution.

Such anarchy, which prevailed in England as well as in France, though in a less degree, could not be permitted to last. It would in time have wrecked society morally and industrially. Although ruinously delayed, relief came at last through the labors of thinkers, statesmen, and revolutionists, but especially through the ameliorations of the long peace that followed the devastating and demoralizing wars of Napoleon. Adam Smith was among the first to come to the rescue. The whole of his great work was a potent protest against monopoly in all forms. He pointed out that "the exclusive privileges of corporations, statutes of apprenticeship, and those which restrain in particular employments the competition of a smaller number than would otherwise go into them" were "encroachments upon natural liberty." † But it was more than fifty years before the laws that he inveighed against so powerfully were finally repealed. In France also the thinkers led the way. "Let complete liberty of commerce be maintained," said Quesnay. "When the interest of the individual is exactly the same as the general interest," said Gournay, "the best thing to do is to leave every man to do as he likes." ‡ Applying these principles to the corporations, Turgot proclaimed that "the right to work is the sacred and inalienable property of the poor man." Again he said, "All sound principles were violated by the accepted doctrine that it was a royal right that the prince might sell and subjects might buy." * But the work of industrial emancipation that he tried in vain to do—a work that might have saved his country from the horrors of the Revolution—was among the first and most beneficent achievements of that frightful convulsion. The Wealth of Nations early

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* Blanqui. History of Political Economy, pp. 183, 184.

† Palgrave. Dictionary of Political Economy, vol. i, p. 430. See whole of Part II. chapter x, Wealth of Nations, Rogers's edition.

‡ Lowell. Eve of the French Revolution, pp. 234, 235.

* Palgrave. Dictionary of Political Economy, vol. i, p. 431

made its way into Germany, and soon leavened the views of her economists and statesmen. From 1808–'10, when the Stein-Hardenberg legislation was enacted, down to the Revolution of 1848, when a change of policy began, the rulers of that war-infested land conferred upon labor their most precious gift and its most precious boon—the right to work. But with the destruction of the tranquillity that closed the first half of the century came the inevitable reversions to political and industrial despotism. "The principles that they recommended for adoption," says Boehmert, referring to the results of the Berlin conference of the Government with the workingmen, afterward crystallized into legislation, "were worthy of the worst epochs of the middle ages."* It was not until twenty years later, under the *régime* of the Confederation, that this legislation was wiped out, and industrial liberty again established. Since then, however, the Franco-Prussian War has occurred. The result was the same as in 1793 and 1848. Freedom has fallen into discredit, and is in danger of eclipse. "There has of late," says Prof. Ingram, "been a feeling in France and Germany that, with the abolition of the restrictions enforced by the corporations, there was a real loss of moral and social as well as economic benefits. In Prussia several efforts have been made to restore them to a free basis; and it is understood that further steps of the same kind are likely to be taken by the German Governments, whose object is thus to establish a sort of police of the industrial world, and solve a part of the great problem of the organization of labor."† As though despotism could, in times of peace and honest toil, solve any problem but the loss of liberty and the ruin of civilization!

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* Block's Dictionnaire général de la Politique, vol. i, p. 539.

† Palgrave. Dictionary of Political Economy, vol. i, p. 43. Since this was written the publication of Mr. Spencer's third volume of Principles of Sociology, page 595, acquaints me with the existence of "a recent measure for establishing compulsory guilds of artisans, a manifest reversion." Even Mr. Lecky, whose views have very little in common with those of Mr. Spencer's social philosophy, has recognized this tendency to revert to feudal despotism. Referring to the ideal of labor leaders, he says, "The industrial organization to which they aspire approaches far more nearly to that of the middle ages or of the Tudors than the ideal of Jefferson and Cobden." (Democracy and Liberty, vol. i, p. 258.) Again he says (vol. ii, p. 441): "A considerable workingmen's party on the Continent, but especially in Austria, Germany, and Switzerland, desires 'obligatory syndicates,' or, in other words, corporations for carrying on particular trades, to which all who practice those trades must necessarily belong. It is a system curiously like the guilds and other trade organizations and monopolies that flourished in the middle ages. In Austria a very remarkable law, enacted in 1883, established compulsory guilds, including all employers and workmen, for the smaller industries, with power of regulating apprenticeships. . . . In 1893 a workingmen's congress, held at Bienne, in Switzerland, unanimously voted for obligatory corporations; a revision of the Constitution was prepared which would have made it possible to establish such corporations and suppress free labor, but it was defeated by a small majority on a referendum vote."

II.

Since Boyleau impressed the corporations into the police and fiscal service of a military despotism, thus converting agencies of order, industry, and humanity into engines of greed and oppression, the conditions of society and the thoughts and feelings of enlightened races have been revolutionized. A state of anarchy no longer exists. War has ceased to be the chief occupation of men. Their ambition is not to murder and plunder their fellows. Devoted to the arts of peace, they have come more and more to exhibit the manners and sentiments of civilized life. There is therefore no occasion for the institutions that feudal confusion and anarchy made needful. A powerful police organization restrains the robbers and murderers. An elaborate system of courts investigates crimes, both great and small, settles disputes between the contentious, and seeks to maintain the rights of the simple and weak against the cunning and strong. Asylums, hospitals, refuges, homes, and charitable societies without number provide for the sick, the aged, the destitute. Education in all the fields of human knowledge, fitting men and women for every position in life, can be had in the universities, colleges, academies, technical schools, and public schools, both primary and secondary, that cover the land. Social and religious organizations minister to every conceivable social and religious need. No obloquy is attached to any honest pursuit. Character and ability have come more and more to be the test of social worth. The great men of the world are not the warriors; they are the captains of industry, the discoverers in science, the thinkers, the scholars, the artists, the philanthropists, the statesmen.

Yet it is proposed to introduce into a society like this—one based not upon war, but upon peace and industry—the institutions that finished their proper work centuries ago;* that survived, in consequence of their alliance with the state, their usefulness so long that they became a curse to man and an obstruction to social and industrial progress. Not only is it proposed, but, as already intimated, steps have actually been taken, to convert the plumbers, the undertakers, the barbers, the horseshoers, the opticians, the dentists, the druggists, the stationary engineers, and other trades and professions into close organizations like those that once covered Europe.† Legislation has been had in several

* Pigeonneau, vol. i, p. 176.

† Since this was put in type my attention has been called to a New York State law, enacted last year, for the regulation of "public accountants," who may be regarded simply as glorified bookkeepers. It provides that any person "over twenty-one years of age and of good moral character," who shall have passed a prescribed examination, shall "be styled and known as a certified public accountant." It forbids any other person to "assume such

States to give them rights and privileges as violative of the principle of equal freedom and as hostile to the interests of society and civilization as those that Boyleau conferred upon the corporations of Paris. Under the specious plea of protecting the interests of the public and of self-improvement, both morally and intellectually—a plea that Boyleau himself did not forget to make *—there is in progress a movement to extend these rights and privileges to the members of the same trades and professions in other States. Unless it is checked, an achievement that has not yet been undertaken, we shall have fastened upon us before we are aware of it the same intolerable industrial and professional tyranny that contributed so powerfully to the French Revolution; for the rules and regulations are becoming so numerous and despotic, particularly those that have emanated from the plumbing trade, that individual liberty, in all that pertains to that business at least, is practically denied. They rival in minuteness and vexatiousness anything that Boyleau produced. For the judgment and will of the person most interested in the perfection of a piece of work are substituted the judgment and will of the person least interested.

If organization, whether industrial or political or social, involves a loss of liberty, it also involves, as the story of the French corporations shows, a more serious loss of truth and honor. It does not lead simply to cruel intolerance; it leads to the grossest hypocrisy. Were the slightest value to be attached to the pleas and apologies of the modern corporations, there would be no possible escape from the conviction that they are animated by the loftiest motives. Their ambition is not limited to self-improvement and deliverance from an obloquy and con-

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title, or use the abbreviation C. P. A., or any other words, letters, or figures to indicate that the person using the same is such certified public accountant." Very curiously so intelligent a journal as the Commercial and Financial Chronicle (February 13, 1897) regards such absurd and obsolete legislation as "very important," believing evidently that it will do much to insure a correct audit of corporation accounts. Yet it is clear-headed enough to see "that even under the best of conditions accountants' examinations are subject to certain limitations," and "such examinations by no means provide a remedy for all the ills of corporate management."

* "Because," says Boyleau, in the introduction to the Livre des Métiers, "we have seen in Paris in our time much jocularity and unbridled lust which is becoming corrupt, and likewise the nonsense of the young and ignorant among the young foreigners and those of the city who neither have nor practice any trade, because they had sold to strangers no things so good or so loyal as they should be." After mentioning the courts of jurisdiction he has established, Boyleau continues: "This we have done for the profit of all, including the poor and the strangers who come to Paris to buy commodities; that the commodities may be so loyal that they will not be deceived by there being some defect; and to punish those who shall receive dishonest gain or, through lack of sense, ask it and take it contrary to God, to law, and to reason."—*Blanqui, History of Political Economy, p. 180.*

tempt hardly less profound and humiliating than that visited upon the honest toil of feudal times; it includes the noble rôle of philanthropist and benefactor. "The principal object of this bill," says the note appended to a measure to regulate the practice of optometry in the State of New York, but really to restrict the sale of spectacles to opticians, "is to protect the public against incompetent and designing persons who may in the future attempt to traffic upon postulate skill in adapting glasses to the sight!" * "To the end that public health and our loved ones" may "be more adequately protected," and "to the elevation of our profession" and the suppression of "the impostors in our business," the undertakers of Indiana, with more tenderness than the opticians, due perhaps to the nature of their calling, ask for the enactment of a bill to create a "State Board of Funeral Directors," and to prescribe certain requirements to the trade. When the barbers of the State of New York met in Syracuse last November to frame a similar measure, they, too, felt moved to proclaim the purity of their motives. "We have been hampered and humiliated for years," they said, "by incompetent people working at our profession." Among these obnoxious persons are "the drunken barbers," the workmen graduated from so-called barber colleges "in the remarkably short time of eight weeks," and, finally, the laborers and mechanics engaged in other occupations during the day that shave and cut hair in the evening, using "one towel on six persons," and charging the demoralizing price of five and ten cents for their dangerous services. "Innumerable people," they add, referring to this alarming peril, "have been inoculated with vile skin diseases, which, in many cases, have baffled the skill of physicians; and we claim," they assert, with the firmness of true philanthropists, animated by a noble principle, "that the public should be protected from these impostors." †

But the most edifying exhibition of disinterested benevolence is to be found in the pleas and apologies of the master plumbers —the strongest of these modern corporations and the happy possessors of the largest rights and privileges under the law.‡ It

* The Optical Journal, vol. ii, No. 10, p. 393.

† The National Barber, December 31, 1896.

‡ As proof of this statement the following extract from the report of the Sanitary Committee at Philadelphia, 1895, may be given: "We have recited the utter lack of sanitary laws as we found at the time of our organization. Now note the change. The necessary preliminaries performed, immediately throughout the entire country the master plumbers' association, by various honorable, just, and enlightened efforts, exerted, too, under the most trying conditions of ridicule, sarcasm, ignorance, and narrow-mindedness, formulated and caused to be adopted regulating laws, now generally termed 'plumbing laws,' or 'rules and regulations of plumbing and drainage.' To such an extent did our labors ramify that, at this writing, there is no city or town, and hardly a hamlet, which is not in a greater or less degree controlled and benefited by our labors."—Proceedings, p. 42.

would not be possible for one unfamiliar with their history to imagine that any labor could ever have been in a more despicable condition. "I have served a sufficient time," said an official essayist * at the Detroit convention of master plumbers, "when the plumber was regarded as somewhat of a scavenger." † How shockingly degraded was the condition of these honest toilers is made still more vivid by the powerful picture of another essayist. "At that time," he said, alluding to the same distressing period, "the term 'master plumber' was a misnomer; he was a slave—slave to the tyranny of established business customs, slave to the reckless, demoralizing practices of dealers, slave to an embittered and hostile public sentiment, slave to the meanest drudgery and sacrifices of the trade, slave to his own weakness and submission." ‡ After speaking of the convention as composed of men "gathered together with no thought of pecuniary reward, to enhance the common welfare of man, to present and discuss the best means of preventing the ravages of disease with its resulting misery and woe," he declared, with rhythmic eloquence on another occasion, that "their profession has made them philanthropists, and their love of mankind has made them benefactors." * The power that wrought this miracle is the organization and legislation that have weeded out "the so-called master plumbers who do not understand their business," who, in consequence "jeopardize the health of the public," and who, through ignorance as to how plumbing should be done, "figure and take work at prices which can not be met by those who are skilled and desire to do good work." ‖

Here we come in contact with the true spirit that animates every modern trade and professional corporation. Without exception, they are struggling, like the old feudal corporations, to limit competition and to secure a monopoly of labor and trade. The plumbers may find much pleasure in calling themselves "philanthropists" and "benefactors"; they may strive laboriously to lift themselves to the plane of "professional sanitarians," ranking, to use the fine phrases of an official essayist, with "God's nobleman, the honest physician"; △ but their real object, however concealed under the alluring garb of rhetoric and sentiment, is to get the largest amount of money for the smallest amount of

* The National Convention of the Master Plumbers has a Committee on Essays, which makes up a list of subjects and selects the best essays on them to be read before the convention. The views set forth in these essays, which are published in the regular reports of the proceedings, may therefore be regarded as "official."

† Proceedings, Detroit, 1894, p. 167.

‡ Proceedings, Cincinnati, 1891, p. 129.

* Proceedings, Denver, 1890, p. 86.

‖ Proceedings, Cleveland, 1896, p. 38.

△ Ibid., p. 95.

work.* One of their number has been honest and frank enough to confess as much. "It is true," said Mr. John L. E. Firmin, of San Francisco, an official essayist at the Philadelphia convention, "that the prime moving cause of our organization was the betterment of our condition in dollars and cents." † However bald and brutal we may think such an impeachment of a noble purpose to "enhance the welfare of man" without "thought of pecuniary reward," it is the exact truth; and for a complete justification of every letter and syllable, no one need go beyond the official statements of the plumbers themselves. The annual reports of the proceedings of the National Conventions of the Master Plumbers' Association of the United States show that in spite of the exalted virtue they have assumed, they have not scorned the selfish policy and despotic practices of feudal times. By proposing the restriction of apprenticeship, by making more onerous the requirements for admission to their associations, by driving from the field they have seized upon the unauthorized persons called in to do their work, by striving to obtain a monopoly of the retail trade in plumbing supplies, they have exhibited all the traits that made the feudal corporations so odious and intolerable, and finally brought them to complete and merited ruin.

That they are not without some conception of the rights of the individual, that they realize the "irrepressible conflict" between their conduct and the principles of the institutions under which they live, there is ample evidence. When the journeymen plumbers of Omaha struck for an advance in wages, the master plumbers of the city discovered a keen enough appreciation of these rights and principles. "Resolved," said one of their resolutions in condemnation of the strikers, "that the members of the Omaha Master Plumbers' Association feel that their business interests are being unnecessarily and unwarrantably interfered with by the Journeymen's Union of this city, in that said organi-

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* Besides the proofs of this statement in the text, the following may be given: A member of the New York Board of Horseshoers told me that one of the objects of their law was to increase the price for shoeing a horse all round from one dollar, charged by the poor horseshoers, to one dollar and a half and two dollars. "Ultimately," said the President of the New York Optical Society, in his address at Syracuse, June 2, 1896, published in the Optical Journal, vol. ii, No. 4, p. 124, "we should . . . endeavor to establish uniform prices for certain articles which are recognized as staples in our business. Great differences in our charges shatter public confidence in their legitimacy." Speaking of the benefits that should follow the enactment of a law to protect the barbers, the National Barber of April 30, 1896, says: "The better class of barbers would reap benefit, *better prices would prevail*, and the barber would then be classed with other professional men." Alluding to the barbers of Illinois, who demand protection also, a writer in the National Barber of December 31, 1896, says: "They are tired of seeing people buying their own razors, and will try to put a stop to such a one-sided practice if they can."

† Proceedings, Philadelphia, 1895, p. 90.

zation, by its rules and acts, denies to the master plumbers the right, as business men, to direct and manage their business affairs according to their own ideas."* How great a difference it makes whose ox is gored is disclosed again in the reply to the demand of the jobbing houses of Salt Lake City that the master plumbers of the town should, under the famous Baltimore resolutions,† restricting the sale of plumbing supplies to master plumbers only, purchase of them alone. "We hold the right," they said, with the true American spirit, "to buy where we can buy the best."‡ The same view as to the rights of labor are to be found in the official essay that Mr. Edward Hayward, of Brooklyn, read before the Milwaukee convention. "Such claim," he said, referring to the claim that "organized labor has rights superior to those of the craftsman or laborer standing alone on his own merits, and supporting the dignity of his manhood," "could never have rooted well and can never flourish long in the atmosphere of a people possessing equal rights and capable of maintaining them. It would not," he added, in a tone of mild admonition,

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* Proceedings, Pittsburg, 1889, p. 55.

† These resolutions were first adopted at Baltimore, June 26, 1884, and reaffirmed and amended at subsequent conventions. The essential part of the original resolutions is as follows: "*Whereas*, the manufacturers and wholesale dealers in plumbing material persist in selling to consumers, to our injury and detriment, placing us toward our customers in the light of extortionists, causing endless trouble; and *whereas*, the system of protecting us from this wrong, which draws in its wake other wrongs, is ineffective, it is absolutely necessary to perfect such a system by united action that will remove these evils from which we have suffered for years; therefore be it *resolved*, that the members of this association confine the purchase of plumbing material to manufacturers and wholesale dealers who sell goods to master plumbers only, as defined in these resolutions." The term master plumber was defined in the following resolution adopted at Washington in 1892 and amended at Philadelphia in 1895: "*Resolved*, that it is the sense of this convention that in the future the interpretation of the term 'master plumber,' as set forth in the above resolutions to entitle him to purchase plumbing material, be construed to mean a master plumber who has an established place of business and represents the industry of plumbing, and who has qualified under State or local enactments regulating plumbing and plumbers, where such exist; or, where no license is required, an individual or firm with an established place of business and representing the industry of plumbing." The following important additions were made at the Philadelphia convention: "*Resolved*, that the members of this association should not sell plumbing material to consumers when they do not furnish the labor for putting the material in. *Resolved*, that the supply houses doing a plumbing supply business and contracting for plumbing work shall be considered unjust competitors." The following are at present exempt from the operation of these resolutions: The United States Government, State, county, and city institutions, Sailors' Snug Harbor, railroad, gas, water, and electric light companies only for such goods as are necessary for their respective lines of business.

‡ Proceedings, Cleveland, 1896, p. 68. See also p. 161, Proceedings, Milwaukee, 1893, where the essayist says: "When rules governing a household, the laws of a State, or of a trade associate alike, are oppressive, they become inoperative by a general disregard of them. The inability of the governing power to enforce them is seen, and contempt for it follows."

"be wise, therefore, for a master plumbers' association, now free, to commit itself to such a dogma, or become a party to practices that would deprive any fellow-workingman of his natural means of obtaining a living."* Neither Adam Smith nor Turgot could have said anything better.

But poor human nature, even of the variety vouchsafed to master plumbers after they have been transformed by organization and legislation into "philanthropists" and "benefactors," is not able to live up to these vigorous assertions of the principle of personal liberty. The yearning it feels for "the fleshpots of Egypt" is too strong to be overcome by unselfish thoughts and sentiments. Blinded morally as well as industrially by its anxious pursuit of "betterment in dollars and cents," it denies to others the rights that it arrogates to itself. Like the old feudal corporations, it would make membership of its benevolent organizations as difficult as possible. "The St. Louis association," said the president of the Milwaukee convention, "has adopted a new constitution, making it a necessary requisite for membership that a candidate must have served five years' apprenticeship and three years a journeyman plumber. This qualification for membership," he added apologetically, "may be a little advanced for some localities, but I believe that the line ought to be drawn between practical and impractical men."† Indeed, it ought; but that is not the object of this restriction; otherwise the work of drawing lines between practical and impractical men would be left entirely to the person that employs them. The object is to make the plumber's business as exclusive as possible, and thus to restrict competition. "It is an undoubted fact," says a report on apprenticeship to the Cleveland convention, which discloses this ignoble purpose, "that many of the evils arising from the present ruinous competition in the plumbing business are due almost entirely to the great number of young men who have partially served an apprenticeship at the trade."‡ But when an organization is once started upon the path of proscription, the steps to the most shameless exhibitions of the spirit of greed and intolerance are soon and easily taken. The Master Plumbers' Association of the United States is no exception. At the Cleveland convention, the Wisconsin delegation proposed that the number of apprentices should be restricted to one for every three journeymen and fraction thereof, and that the plumbers of the United States withdraw their "moral and financial support from all plumbing trade schools, as we think they tend to increase the ranks of the master plumbers."* Reflect upon the significance of such extraordinary

* Proceedings, Milwaukee, 1893, p. 162.
† Ibid., p. 71.
‡ Proceedings, Cleveland, 1896, p. 130.
* Ibid., p. 77.

words. They are a condemnation of technical education. Never were the feudal corporations guilty of anything more retrogressive, or more subversive of their own interests or the interests of the public.

It is but just to say that as yet the master plumbers have not established an apprenticeship or a journeymanship despotism. But that they are not lacking in the spirit that leads to both is manifest from their efforts to control the retail trade, which have been more persistent and systematic, and therefore more successful. Ever since the National Association was organized, they have striven to put a stop to the traffic between jobbers and consumers. So twisted have become the moral perceptions of the master plumber that deprivation of the profits from this traffic appears hardly less reprehensible than a fraud. "The jobbing houses," says the report of the vice-president of the Minnesota Association to the Detroit convention, calling attention to this species of crime, "are selling material to general contractors and owners of buildings, and hiring a plumber by the day to do the work, thus doing the boss plumber out of the profit that rightfully belongs to him."* Because of such a perversion of the ethics of trade, the natural fruit of organization and monopoly, it has almost ceased to be possible for corporations and the owers of large buildings, not to speak of the smaller and less influential victims of the "philanthropists" and "benefactors," either to do any part of their own plumbing or to get from a dealer the supplies needed for the work.† The definition of a plumber has been so narrowed that it does not apply to plumbers in the employ of either of these classes; and the definition of plumbing materials has been so broadened that it includes everything that a plumber handles. "I believe," said a New York delegate to the Cleveland convention, setting forth the view that has generally been adopted, "that everything that we handle is plumbing goods. I believe the meter, and the pump, and the range, and everything in a specification called for in the plumbing line, and which we have to handle, is plumbing goods."‡ To such refinements has the lexicography of the plumbing trade been carried that a distinction has been drawn between plumbing goods that can and those that can not be sold to a shipbuilder, without the intervention of

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* Proceedings, Detroit, 1894, p. 67.

† In 1894 Mr. Oakes A. Ames and other large property owners attempted to get the following reasonable amendment made to the Massachusetts plumbing law: "Any person may, by himself, or his usual employees, without obtaining a plumber's license," as provided by the law, "do any proper plumbing work upon his own premises, and in doing such work shall not be restricted to the use of plumbing materials that can not be purchased in open market." But the amendment, which was denounced by so enlightened a journal as the Boston Herald, was defeated.

‡ Proceedings, Cleveland, 1896, p. 89.

the master plumber as middleman. To the former belong all supplies used in constructive or repair work in a shipyard, and to the latter all supplies used in constructive or repair work outside of a shipyard, and not requiring the special skill of the shipbuilder.*

But the arrogance of this modern trade corporation does not end here. Not content with denying to an American citizen the right to buy gas fixtures, or galvanized iron pipe, or bath tubs, or kitchen boilers from whomever he pleases; nor with telling him that he must not use wooden washtubs in his laundry, and that he must have at least one bathroom for every ten persons in his family;† nor with prescribing a code for the construction of his plumbing as minute and tyrannical as any that Boyleau ever dreamed of; nor with proposing a government inspection and approval of the plans of architects, especially with regard to light and ventilation;‡ the master plumbers have sought to bring under their wise and benevolent jurisdiction the management of the business affairs of the government of cities, counties, States, and even of the nation. A California law provides that in the specifications for any State building, those relating to the plumbing must, to use their own jargon, be "segregated," and submitted directly to the plumbers for estimates.* The dignity of this noble organization of "professional sanitarians," which is coming to rival that of the feudal corporations, forbids the acceptance of a subcontract. "Master plumbers," said the president of the Texas association, after describing an attempt made in San Antonio to force upon the county commissioners the observance of the same absurd and tyrannical rule, "should never be second fiddlers to any contractor."‖ The ordinances of San Francisco and other cities provide that no one but a regularly licensed plumber shall touch the sewers, thus compelling the payment of plumber's wages for the work of a laborer. Two years ago, the Master Plumbers' Association of Illinois passed a resolution that the United States Government should be denied the right to buy plumbing supplies from the jobbers.△ Is it any wonder that the Sanitary Committee urged in a report to the Philadelphia convention that "upon every favorable opportunity," the plumbers should "endeavor to disabuse the public of the idea that our legislative duties are selfish"?◊ Is the idea altogether fanciful?

I have already mentioned how the feudal corporations took

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* Proceedings, Cleveland, 1896, p. 141.
† Plumbing Code of Rochester, N. Y.
‡ Proceedings, Philadelphia, 1895, p. 45.
* Ibid., 1895, p. 80.
‖ Proceedings, Detroit, 1894, p. 79.
△ Proceedings, Philadelphia, 1895, p. 54.
◊ Ibid., 1895, p. 43.

one of the most effective steps of organization and monopoly to retain power, namely, the selection of patron saints, the adoption of rites and ceremonies, and the use of banners, badges, and distinctive costumes. Most curiously, master plumbers have not neglected to propose a like step to safeguard their rights and privileges. "We would urge upon the Executive Committee," said Mr. James Ryan, the vice-president of the District of Columbia Association, "to make some recommendation that a ritual be adopted. . . . We would also recommend a suitable badge or emblem be adopted for all local associations, making it a universal badge throughout the country."* I have still to learn, however, that they have chosen a fitting patron saint. Is it because they have not heard of Cagliostro?

[*To be continued.*]

EXPERIMENTS ON THE PHYSIOLOGY OF ALCOHOL, MADE UNDER THE AUSPICES OF THE COMMITTEE OF FIFTY.

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II.

IT may be well to call to mind the title of this paper, which is *experiments* upon the *physiological* influence of alcohol. We purpose to adhere closely to "experiments" and to "physiology." Dogs could be killed in a few minutes, or a few days or months, by sufficiently large doses of alcohol. While such experiments might have some interest to toxicology or pathology, they could not have much for physiology, because in such violent procedures the abnormal must greatly overshadow the normal functions of the animal.

April 27, 1895, I obtained two pairs of cocker-spaniel puppies: the males, brothers from the same litter; the females, sisters from a not-closely related litter.† All four happened to have

* Proceedings, Detroit, 1894, p. 72.

† The dogs were obtained from Mr. C. G. Browning, of Worcester, to whom I am under great obligations for assistance and advice as to kennel management. Tipsy and Topsy were bred by him. Nig and Bum he kindly obtained for me from the Swiss Mountain Kennels at Germantown, Pa., bred by Mrs. Smyth. Considerable expense was involved in getting such good stock, but a number of considerations seemed to render it advisable. In no other way could such uniformity and comparability have been attained. The heredity of mongrels could not have been traced, in case anything of interest should crop out in that important field. In this connection I wish to express my thanks to both Mrs. Smyth and Mr. Browning for valuable aid already received, and for their cordial assurances of help in future, should later developments require it. Another consideration, which weighed some-

been born February 22, 1895. They were as nearly alike as it was possible to get them. The males are black, the females red.

It will save time and confusion if we christen them at this point, and use their respective names in our subsequent descriptions. The sisters were named "Topsy" and "Tipsy," the males "Nig" and "Bum." The names are sufficiently suggestive to

Bum. Tipsy. Nig. Topsy.

FIG. 6.—November 27, 1895.

enable the reader to carry easily in mind which ones are given the alcohol and which are normal.

April 29th, they weighed as follows:

Tipsy.....	2,102 grammes.	Bum.....	2,179 grammes.
Topsy.....	2,150 "	Nig.....	1,556 "

For about two weeks the four were studied with reference to deciding which pair to treat with alcohol. Of the sisters, Tipsy was considerably the more active and playful; of the brothers, Nig was the livelier. Bum, at the time, is noted as being a little "shy and quiet." Otherwise he appeared considerably superior in health, vigor, and "points." Nig's already deficient growth—since dwarfing is one of the important points about which the experiment turns—finally decided the matter, viz., to give the alcohol to Tipsy and Bum.

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what with me, was that in the resident part of the city I could hardly expect to have a kennel of mongrel curs tolerated for the necessary length of time. Intelligence, too, was a prime consideration. For this, as well as for good disposition, these dogs could leave nothing to be desired. In selecting this breed I feel that the choice was made more wisely or more fortunately than I knew.

The administration of alcohol was begun May 12th, six cubic centimetres of chemically pure alcohol, diluted to forty per cent with water and mixed with their breakfast, being given to Tipsy and Bum. No appreciable effect was produced. Accordingly, the

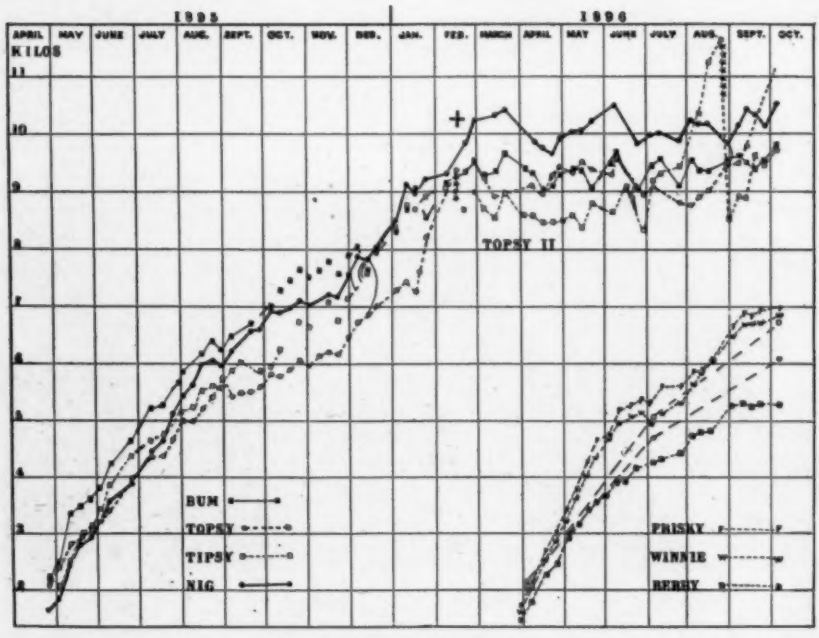


FIG. 7.—GROWTH OF THE DOGS.

dose was increased daily until May 24th, when they received twenty-five cubic centimetres apiece. This caused rather pronounced intoxication, but nothing approaching stupor. Both dogs appeared next morning as bright and playful as ever.

My intention at this time was to run the experiment along the line of light daily intoxication, but, with Dr. Billings's concurrence, what seemed to be a better physiological limit was adopted.* It was decided to give as large doses as possible, short of producing noticeable symptoms of intoxication. Accordingly, the amount was reduced to fifteen cubic centimetres, which was increased to twenty cubic centimetres by June 10th, and thereafter, as the dogs grew, up to thirty-five cubic centimetres apiece by the

* For the suggestion as to the proper physiological limit, I am happy to acknowledge my indebtedness to Mrs. Hodge. At the time when Tipsy and Bum were first intoxicated, the only time they have been intoxicated, Mrs. Hodge not only suggested the physiological limit, but went to considerable pains of argument to turn me from my avowed purpose of "getting the greatest physiological (?) effect in the shortest time." This has been a prime defect of similar work in the past, and whatever of value may attach to the present research I consider as mainly due to this suggestion.

following January. As seen from the chart, Fig. 7, they have practically attained their growth at this time. During the following year it was possible to increase the dose only five cubic centimetres—to the amount given at present. February 21, 1897, Bum's weight was 9,950 and Tipsy's 10,060 grammes. It thus appears that the physiological limit for a non-intoxicant dose of alcohol in the case of our dogs is about four cubic centimetres per kilogramme.

It is readily seen that this amount is equivalent for a man weighing seventy kilogrammes to two hundred and eighty cubic centimetres daily and taken at a single dose. This is ten ounces, whereas the physiological limit for man is usually stated as two ounces. This, of course, refers to absolute alcohol, and corresponds to nearly three times the amount of moderately strong whisky. It may be contended that this is too much or too little, but it still seems to me that no better rule could have been fol-

Bum. Tipsy. Nig.

FIG. 8.—April, 1896.

lowed in the matter. While it may not be the golden physiological mean, it would seem to be safely within the physiological extreme, as the perfect general health of the dogs has shown.

As to details of feeding, each dog receives, in a separate dish

equal quantities of solid food and milk at six o'clock in the evening. The alcohol is thoroughly mixed with this meal. In the morning, each is given half a Spratt biscuit. This forms the staple diet, but is generously fortified with good meat, both raw and cooked, and plenty of good gnawing bones.

Bum. Nig.

FIG. 9.—October, 1896.

A large, sunny yard, kept clean; a good, dry kennel, and good kennel hygiene, including frequent disinfection; clean, cool water, three times a day in hot weather; dry beds with plenty of clean straw and sawdust; careful and regular attention to parasites, both internal and external—all these things have conspired to render the experiment thus far physiologically ideal.

The dogs were weighed, always before their breakfast, at first daily; later, every week. Their respective lines in Fig. 7 tell the story of their growth at a glance. Until nine months of age, Bum remains heavier than Nig. Topsy is evidently destined to be a much smaller dog than her sister. February 21, 1897, they weighed as follows:

Nig	10,520 grammes.	Topsy II.....	10,630 grammes.
Bum.....	9,950 "	Tipsy.....	10,060 "

Both the alcoholics are thus seen to be a little lighter than their controls, 5·4 per cent. This does give a small margin in favor of the normal animals, but it is doubtful whether four puppies would be found to grow under normal conditions more uniformly and come out more evenly at the end of two years. It would certainly be straining a point to claim any "stunting" effect of alcohol administered as above described.

For the general setting of the experiment, it only remains for me to add that, barring the accidental death of Topsy, and a trifling exception in Bum's case, the health of all the dogs has been perfect from the beginning of the experiment up to the present. Tipsy and Bum have not always eaten all that was offered

them, possibly because so much quieter than the normals, but practically none of the dogs has "missed a meal."

Again, by a substantial favor on the part of Mr. Browning, I was able to obtain Topsy II, also Tipsy's sister, from the same litter. While Topsy II has thus had a somewhat different life for a time, in form and weight she makes a much more comparable match for Tipsy—so that, hard as it seemed at the time, "Little" Topsy's death has undoubtedly resulted in a fairer setting for the experiment.

So much, then, for the side of purely physical growth, and there is in it little consolation for those who are wont to recite the "stunting" and the disease-inducing effects of alcoholic indulgence. But we are engaged in a search for truth, and not for consolation.

Still another line of physical evidence remains to be examined, which bears closely upon the deepest psychic functions of animal life.

What is the sexual and reproductive history of our animals?

Sexual periods are indicated upon the chart, and stars occurring in Topsy's and Tipsy's curves of growth signify whelping, the number of stars corresponding with the number of whelps. From the chart we may read that Tipsy failed to conceive at the first season, while Topsy conceived normally. Mr. Browning has investigated the matter for me both in his own and other kennels, and is able to state that failure under these conditions is rare, probably not occurring in ten per cent of the cases. Controlled as the experiment is, this may indicate a tendency in alcoholic animals toward sterility. But, reading further along in the chart, we are forced to yield all benefits of this doubt when we find Tipsy bringing into the world no less than seven puppies. Since completing this draft of the chart, Topsy II has whelped for the first time, October 27th, giving birth to five, and Tipsy has whelped a second time, giving birth again to seven.

FIG. 10.—Tipsy, October, 1896.

Comparing the puppies of the first litters, Tipsy's weighed together 1,470 grammes, averaging 210, and Topsy's 1,080, averaging 216 grammes. Topsy also had the smallest puppy born—120 grammes—Tipsy's smallest weighing 190. Tipsy has also the honor of owning the largest puppy born, 265 grammes, Topsy's

largest weighing 260. The last one of Tipsy's whelps was born dead; all of Topsy's were born alive.

Both Demme* for man, by comparing normal with alcoholic families among the Swiss, and Mairet and Combemale† in experiments upon dogs, have attempted to prove that deformity, degeneration, involving especially the brain, and a number of abnormities of a nervous character may be caused by chronic alcoholism of the parents. We have also Morel's‡ account, so often quoted, of degeneration in an alcoholic family to idiocy and extinction in the fourth generation.

FIG. 11.—Topsy, October, 1896.

With these things in mind, it is of interest to note that two of Tipsy's puppies were hare-lipped on both sides, a serious deformity of the face. All of Topsy's puppies were normally developed. This might be interpreted as confirmation of the above authors. However, practically all the value of such complicated experiments depends on repetition and upon adequate controls. The smallest puppy of Topsy II presented the same abnormity in exaggerated degree.

From the first litters each mother has thus to her credit four healthy living puppies, and Tipsy's are in no wise inferior. In Tipsy's second litter, February 1, 1897, three were deformed, two were born dead, and the remaining two proved to be nonviable. This may indicate a progressive deterioration, but any interpretation of it had better be delayed until more evidence is obtained. It is sufficient to indicate that results are likely to increase in definiteness as the experiment proceeds.

At the suggestion of Dr. Billings, a confirmatory experiment was undertaken in which, instead of chemically pure alcohol, the ordinary beverages—whisky, wine, and beer—were administered. The experiment was begun with three female puppies from the same litter, half sisters to Tipsy and Topsy, obtained from Mr. Browning. These were named Frisky (whisky), Winnie (wine), and Berry (beer). It was first attempted to get them to take their respective drinks as beverages, to develop in them a liking

* Demme. Ueber den Einfluss des Alcohols auf den Organismus des Kindes. Stuttgart, 1891.

† Mairet et Combemale. Influence dégénérative de l'Alcool sur la Descendance. Compt. rend., cxi, 667, 1888.

‡ Morel. Traité des Dégénérescences de l'Espèce humaine. Paris, 1857, p. 125.

similar to that sometimes found in man, so that it might not be necessary to give the liquors with their food. About two weeks were lost in this attempt during the first part of April. They practically refused to take enough to make the experiment worth trying. Accordingly, the doses were given, as with the others, mixed with their food at night.

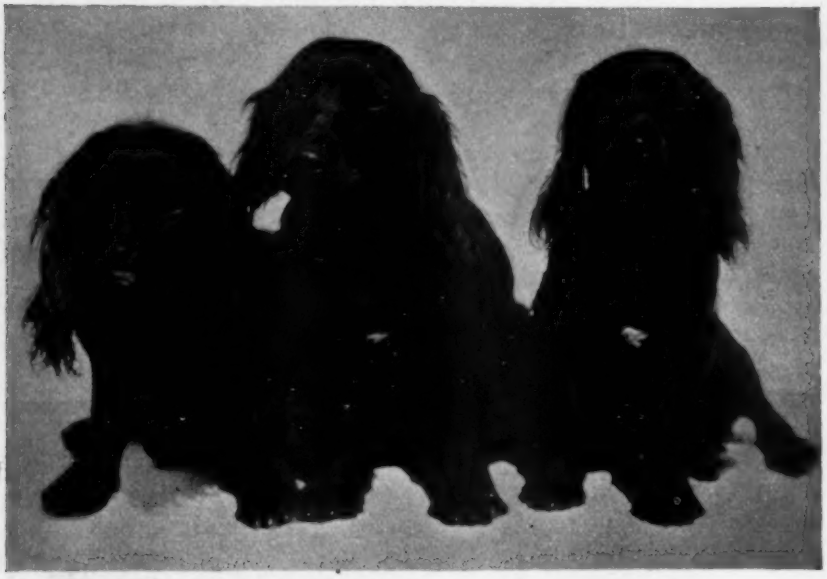
The amount necessary to give in order to make the experiment at all comparable with the others, as to amount of alcohol, was such as to make their meals very wet and bulky. Curves of their growths are included with that of the others in Fig. 7. They are seen to grow well from April to June, Berry falling considerably behind. They then came down with eczema, Berry having it worst, Winnie somewhat lighter, Frisky not quite so bad as either. I do not feel warranted in attributing this to either the liquors employed or to kennel management, for no trace of the disease had made its appearance before or with any of the other dogs. It certainly could not be considered an alcohol effect, for the largest dose of beer, 125 grammes, that Berry could take contained no more than 5·5 grammes of alcohol (the beer contained

Tipsy. Topsy II.

FIG. 12.—October, 1896.

4·3 per cent). I am strongly inclined to think that both the eczema and the scrawny growth of all three puppies is to be attributed mainly to their sloppy food—i. e., a water effect. A number of books on the care of dogs caution strongly against making the food of puppies "sloppy," danger of causing eczema

being one of the chief grounds. On the whole, Frisky and Winnie are seen to have grown a trifle faster than Tipsy, which would indicate the absence of deleterious ingredients in the wine and



Frisky. Winnie. Berry.

FIG. 13.—October, 1896.

whisky. They were bright, promising puppies to begin with, but they have grown into a sorry-looking lot, as is witnessed by Fig. 13.

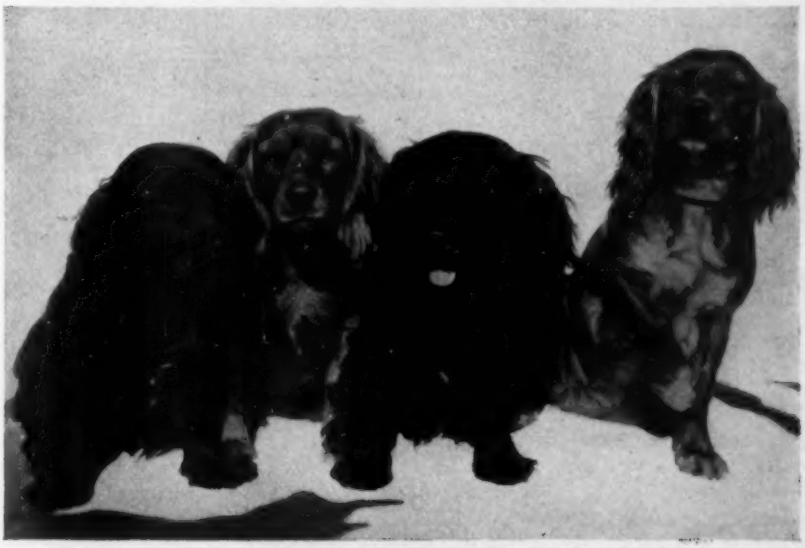
After all, the only true physiological expression of the value of an animal's or a man's life is the total amount of energy developed and utilized during its continuance; and while, in order to attain to a proper relation to the energy material around it, it becomes necessary for the animal to develop a certain mechanism of this or that size and form, and with such and such parts, still as little energy as possible is wasted in forming the machine. An animal dead, in the chemical composition of its body, contains but a small fraction of the energy which it is able to utilize during its lifetime, and even the greater part of this is contained in the food from which its body was formed. This fraction, possibly one one-thousandth, whatever it may be, would give us the first adequate expression ever obtained of the relative values of human anatomy to human physiology, of the physical body and the life work.

Thus, in our purely physical and anatomical analysis of the experiment so far, we have studied only this small fraction of the whole life story even of a dog. In going on to the side of

function, the psychic-volitional side of life, we are at once met by the difficulty of lacking terms and measures with which to express in verbal descriptions but a small fraction of the truth.

This has been my reason for supplementing descriptions with as many photographs as possible. And if the reader will study closely the expression of each face through the whole series, especially if he be somewhat familiar with dogs' faces, he will get the best idea that I am able to give by any expression within my power of the difference between the alcoholic and normal dogs in just this important respect, the vigor, the "life," the "go" that is in them. Look at the faces in Figs. 6, 8, and 14, and in all the rest, and come to any conclusion you can or wish. It will not be possible for me to say anything which shall change it.

It was not until alcohol had been given for nearly two months, early in July, that it became quite noticeable that Tipsy and Bum were a little quieter than the others. This became gradually more marked. By September they were rather often caught napping in the shade, while Topsy and Nig were playing actively. They had developed also a cringing, trembling timidity, for which



Bum. Tipsy. Nig. Topsy II.

FIG. 14.—October, 1896.

nothing either in my treatment of them or in their relations to the other dogs could possibly account. Whipping was most carefully avoided from the first, a spat from the open hand being my limit of severity. If a switch was used, it was to strike the ground or the fence and not the dog. Practically they have received nothing but assuring caresses at my hand, and still this unac-

countable fear, this cringing and trembling like a Chinese culprit before his executioner. (See Figs. 15, 16, and 17.*)

Some may contend that the dogs were not comparable in the first place. This, of course, is possible, but I do not feel that in this respect the experiment could have been improved upon. The

FIG. 15.—Bum, November, 1895.

presumption is, in fact, very strong against any such interpretation of the facts.

I can conceive of no other interpretation than the evident one, viz., that we have to do here with one of the physiological causes

* For want of space we are obliged to omit the two figures with which it was intended these should be compared. They represent Nig and Topsy sidewise, standing naturally, and with no signs of fear.

A word may not be amiss at just this point as to my method of obtaining the photographs. Mr. C. C. Stewart manipulated the camera, while I controlled the dogs, in procuring the negatives for Figs. 6 and 8. All the rest I took myself, most of them alone, a few with Mrs. Hodge's help. It was recognized from the first that all the dogs must be treated exactly alike, and the rule was laid down at the beginning that, no matter how badly they behaved, no spatting, not even a sharp word, should be indulged in while they were on the photographing stand. The whole procedure was given the character of a frolic, in which, when they "sat still and looked pretty," bits of meat or biscuit were given to all alike, and no punishment or reproof was administered on any account. I may have failed unconsciously, but, if I did, it was with the irrepressibles, Topsy and Nig, and not with Tipsy or Bum.

Furthermore, nothing of the nature of "intoxication effect" was possible in any of the photographs. As stated above, the dogs were given their alcohol at evening, and then not in doses sufficient to produce intoxication, and the pictures were taken about noon. And, further, for several of the pictures, notably 6, 8, 14, and 15), alcohol was purposely omitted the night before.

or conditions of fear. There may, of course, be many others. Magnan * obtained precisely similar results with his alcoholic dog, much more extreme, because he gave much larger doses. The literature of human insanity makes fear a characteristic psychosis in alcoholic insanity, † and delirium tremens is probably the most terrible fear psychosis known. Even with the amounts of alcohol given, Bum has shown several mild paroxysms of fear, with some evidence also of hallucinations.

I am unable, therefore, to escape the conviction that our experiment has a meaning as deep as the psychology of fear itself. As to how deep that is, we may hope to learn something in studies that are now being prosecuted. ‡

As to temper and disposition, neither the breed nor the individual dogs can leave anything to be desired. Aside from their timidity, I can not recall that either Bum or Tipsy were ever even "impolite" toward me. They have never shown the least

FIG. 16.—Tipsy, November, 1895.

bit of resentment or snappishness. Not so much can be said for either of the Topsys or for Nig. But they are much more cheerful. The tone of sadness, the same as is noted in Magnan's dog,

* Magnan, V. On Alcoholism. London: Greenfield, 1876, p. 18 ff.

† Möbius, P. J. Nervenkrankheiten. Leipzig, 1893, p. 74 ff.

‡ G. Stanley Hall. Children's Fears. American Journal of Psychology, viii, No. 2.

so well shown in many of the pictures, is characteristic for Tipsy and Bum. It can be lightened up at times so as hardly to be recognized, but still it is the prevailing tone.

Neither of the pair, however, even yet lacks spirit, when it comes to maintaining their rights in the kennel; and for months after their characteristic timidity was noticed both Tipsy and Bum were larger and stronger than their mates, and held the balance of power.

Jealousy, amounting almost to frenzy, has been a striking feature in both the Topsys. They both showed great distress, especially when I petted Tipsy. Nig has something of the same kind strongly developed, but is too noble to show any spite toward the other dog. However, if he is around and I stoop to pat Bum on the head, Nig generally manages to get his head there in time to catch the pat. So I am obliged to use both hands, and Bum has never given evidence of the least jealousy even

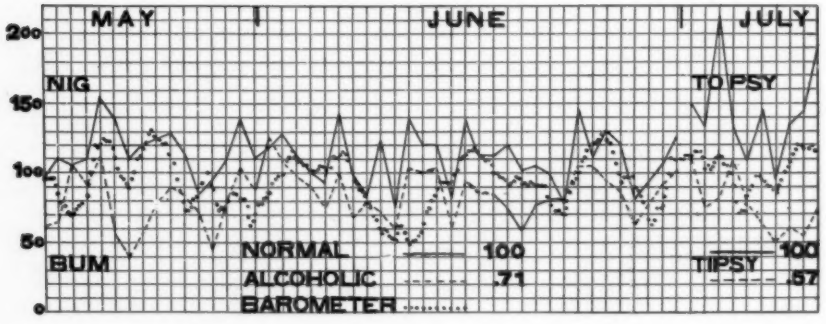


FIG. 17.—DAILY ACTIVITY.

under Nig's provoking interference. Nor has Tipsy ever evinced a trace of the emotion.

The development of intelligence is a wide field in which it will be possible to touch but a few points.

At first I had intended to test this by ability to learn tricks. The idea was abandoned for two reasons. First, it would absorb too much of my time; and, second, after reading Mr. Russell's* paper on child study, I decided that it was just the thing not to do. By that method we might have learned trick psychology when the thing of real value for us is the spontaneous, uninterfered-with psychic growth of a dog.

Some few things had to be taught, such as coming at call and whistle and individual names, and retrieving was taught for a special purpose to be mentioned later. In addition to this, lit-

* E. Harlow Russell. The Study of Children at the State Normal, Worcester, Mass., Pedagogical Seminary, ii, p. 343.

tle trick specialties began to crop out during the first summer. Tipsy, always the lithest and quickest, became expert in jumping and catching on the fly. Bum, all of his own accord, took to sitting up and "begging." Little Topsy would sit up and "speak." Nig did not develop any specialty, and never really discovered his mission in life until he was taught to "fetch." As to the learning itself, Bum and Tipsy were about as quick and much more docile than Topsy and Nig.

It was stated above that during the second month after administration of alcohol spontaneous activity of both Tipsy and Bum became noticeably impaired. This gradually and steadily increased until, last spring, it seemed to me from daily observation that the alcoholics were not much more than half as active as the normals. How to secure an objective expression of this fact presented some difficulties at first. To put them in large recording cages, such as we use in the laboratory to study the daily activity of rats and mice, would clearly be an imposition on a dog's good nature, and would possibly suppress his activity in proportion to his intelligence. To watch four dogs during the twenty-four hours would require four observers, and their presence would be a disturbing factor.

Pedometers were thought of, but none could be found suitably constructed for use with the dogs. Finally, Waterbury watches were obtained and, by removing the hair springs, weighting the balance wheels unequally, and by proper adjustment of buffing pins so that the balance wheel could move just far enough to release the escapement, a watch resulted which ran only when shaken. After a month of preliminary trials an adjustment was attained so delicate that the watch could hardly be jarred so slightly as not to release the escapement one tooth, and the two could be shaken, violently or gently, and in any position for an hour at a time (fastened firmly together) without showing a variation of more than two seconds on reading the hands.*

The watches are now placed in stout leather pockets in specially constructed collars and the dogs allowed to wear them. The results are graphically expressed in Fig. 17. The watches were read every evening at exactly six o'clock, and the reading plotted so that the angles in the lines for each dog correspond to the number of minutes the dog has ticked his watch during the twenty-four hours. The chart explains itself. Bum is seen to develop seventy-one per cent of Nig's activity, and Tipsy only fifty-seven per cent of Topsy's.

The watches, of course, give us only the total quantity of

* For valuable assistance in accomplishing this adjustment I wish to express my thanks to Mr. Albert P. Willis, Fellow in Physics, Clark University.

spontaneous daily movement of each dog with no indication as to its quality. Something to give a qualitative expression of strength, ability, and resistance to fatigue was devised, which consisted in a series of competitive tests at retrieving a ball.

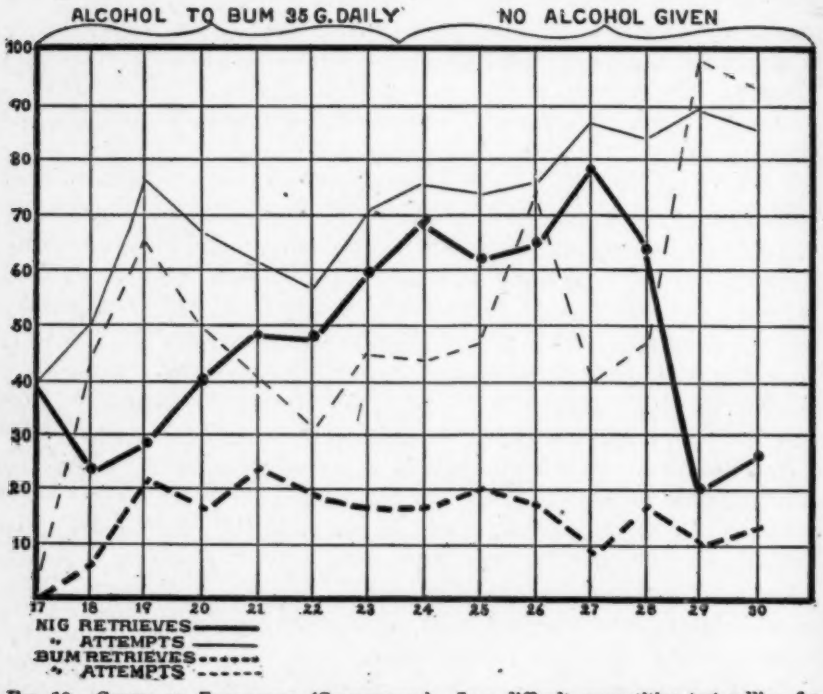


FIG. 18.—CURVE OF EFFICIENCY (COMPETITIVE). In a difficult competitive test calling for endurance, sustained attention, etc., the alcoholic falls much lower relatively than in ordinary daily activity, Bum attaining to only thirty-two per cent of Nig's efficiency.

The balls were thrown in rapid succession across the university gymnasium, one hundred feet, and a record was kept of the dogs that started for it and of the one that succeeded in bringing it back. One hundred balls constituted a test, and to throw them consumed about fifty minutes.

In the first series, consisting of 1,400 balls thrown on successive days, January, 1896, the normal dogs retrieved 922, the alcoholics 478. This gives the alcoholics an efficiency of only 51·9 per cent as compared with the normals. Bum's ability in this series as compared with Nig's is only thirty-two per cent.* (See Fig. 18.) It was also noted that Bum and Tipsy were much more easily fatigued than the normals.

A second series, of 1,000 balls, November, 1896, in which Bum and Nig were tested, gave similar results. The various elements

* The results from Topsy and Tipsy were not comparable, on account of Topsy's condition at the time.

of the experiment are plotted in Fig. 19. The heavy lines, N and B, above the zero level express the relative efficiency of Nig and Bum, and indicate the number of balls retrieved by each dog. The light lines, *n* and *b*, express the number of times each dog attempted to get the ball. Nig's line of achievement is seen to run much closer to his line of attempt than in the case of Bum. Fatigue is expressed below the zero line, and is derived from the number of times each dog lay down to rest. Nig shows fifteen per cent of Bum's fatigue. Expressed in other words, Bum lies down to rest 6·7 times to Nig's once.

It is clear that we must advance beyond the usual anatomical standards of comparison into the field of function, if we are to arrive at any definite settlement of physiological questions. Efficiency, ability to do work, must be the ultimate appeal. While nothing is further from my thought than to claim for the foregoing experiments sufficient comprehensiveness to even approximate to a solution of this important problem, still, as stated at the outset, their results may serve to hint at the possibilities of future work. The experiments are still in progress, their continuance being assured for one more year by the Committee of Fifty. It is to be hoped that they can be carried on much longer, to yield, at least, the complete life story of the original four dogs. The present opportunity should also be utilized to study the next generation in a similar way, if there should appear marked signs of degeneration. Results are certain to increase in definiteness and value as the experiment is prolonged out of all proportion to additional cost.

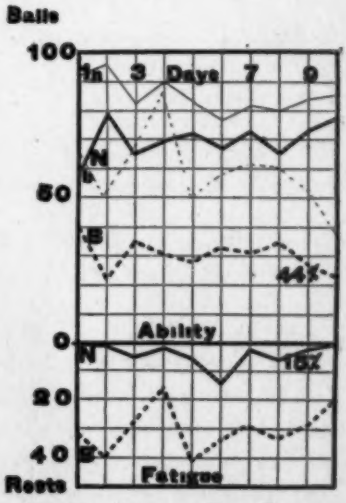


FIG. 19.—CHART OF BALL TESTS.

On the side of physiological activity, while a number of other forms should be studied, and experiments need repetition to guard against individual variations, the results obtained—retardation in growth of yeast, and depression of activity in kittens and dogs—cast a suggestive light on the human experiment. The spontaneous desire and the will welling up within a vigorous organism to be and to do something worth the while seems to me the highest thing in life. Hence knowledge concerning physiological conditions which favor elaboration of this quintessence of existence possesses a human value beyond computation or expression.

Helmholtz has said, in describing his methods of work, that

slight indulgence in alcoholic drinks dispelled instantly his best ideas. Prof. Gaule once told the writer, as an experiment during the strain of his "*Staatsexamen*," that he suddenly stopped his wine and beer, and was surprised to find how much better he could work. An eminent professor in Leipsic once said that the German students could do "twice the amount of work" ("*könnten zweimal so viel leisten*") if they would let their beer alone. Dr. August Smith * has found that moderate nonintoxicant doses of alcohol (forty to eighty cubic centimetres daily) lowered psychic ability to memorize as much as seventy per cent. Leixner † observes "*dass der Alcohol den Menschen geistig so herunterbringt, dass er schliesslich nichts mehr kann, wie politisieren.*" Possibly the trouble with a good deal of our politics in this country.

But we must be careful about drawing too sweeping conclusions. A man "in the habit" may be unable to do anything without his usual stimulant. This fact must be recognized. And if, according to the theories of some, acquired characters may descend to the offspring, "inherited" habit may also require consideration. At any rate, we must cease to expect that problems which have baffled human solution for generations can be settled in a day or a year. They can be sanely solved only by the accumulation of wholly impartial evidence, sufficient in amount to determine conviction.

Truly to me
There seems to be
A kinship close
Wherever flows
Life's activity.

LIFE ON THE PLANETS.

By M. J. JANSSEN. ‡

(HAVING shown how all astronomical discovery, concluding with spectrum analysis, points to a similarity of constitution in the earth and the heavenly bodies, M. Janssen continues:)

All this whole forms a single family, the members of which have a common genesis and have been formed with the destiny of becoming worlds like ours. Their movements around the central star which enchains them by its powerful attraction are subject to the same laws, and that star, by virtue of its high temperature and the immense reserves of force it contains, sheds upon them

* August Smith. Die Alcoholfrage. Tübingen, 1895.

† Leixner. Laien-Predigten für das deutsche Haus. Berlin, 1894.

‡ From his remarks at the annual meeting of the French Academy of Sciences, October 24, 1896.

those influences and radiations which go to place upon their surface the generative elements of life. Yet while these stars present so strict analogies in formation and nature, they do not by any means indicate the same degree of advancement in what may be called geological or rather planetary evolution, or that which tends to the appearance and development of life on their surface. Here the conditions of mass, of distance from the sun, and doubtless other circumstances still unknown, come in to order the epoch and the extent of these developments; but we can affirm, without going beyond the inductions permitted by the condition of science, that if life has not yet been established directly on the surface of any of the planets, we have very strong reasons for assuming its existence on some of them. We may regard this conclusion as gained from the long labors of antiquity and modern discoveries.

We say that, while the problem has not been directly resolved by the eyes, it has been worked out by an aggregate of facts, analogies, and rigorous deductions that leave no room for doubt. This is the mature and perfect fruit of science. It is the view of intelligence, as certain an authority and of even a higher and nobler order than the senses. I say further that what we know of the unity of the chemical composition of the matter of the sun, the stars, and the nebulæ permits us to make new inductions respecting the part performed by the bodies which are on the earth the most important factors of the phenomena of life. It is thus infinitely probable that hydrogen, oxygen, nitrogen, carbon, and especially water, which on the earth are the indispensable constituents of vegetable and animal life, fill a like office not only in the planets of our system, but throughout the universe.

Water in particular, by virtue of its chemical functions and the properties with which it is endowed in the solid, liquid, and gaseous states—properties which are so admirably fit for the accomplishment of physiological processes—is a unique substance, and the search through the whole series of chemical compounds for any body that can take its place has been in vain. The discovery of the spectrum of the vapor of water permits us to deduce and assert its presence in the atmospheres of the planets and in those of a whole class of stars as well. Drawing from these results the fact of the presence of hydrogen, one of the generative gases of water, in nearly all the stars, we are justified in supposing an extreme diffusion of that important element from the point of view of the unity of the phenomena which control the production and maintenance of life.

Thus, the more science advances, the more is that great law confirmed and established of unity in the material elements, in

the compounds formed of those elements, and in the constitution of the stars and the parts they perform in the grand whole.

Are we authorized now to assume from this a unity of forms that life may put on not only in the sister planets to ours, but also in the other systems of worlds scattered through the skies? May we especially push our inductions still further and higher, conclude from such material unity upon a mental and moral unity, and say that, as there is only one physics and one chemistry in the universe, there are also only one logic, one geometry, and one moral, and that the beautiful, the good, and the true are identical and of the universal order everywhere?

Science, embracing in its results only immediate and demonstrated facts, does not warrant us in going so far as this, but with the truths it unfolds to us seems to invite us toward it.

There were brilliant minds in antiquity, which upon bases otherwise restricted conceived and proclaimed verities concerning the world and the universe which the most modern science has only been able to confirm.

Let us, then, respect these cheerful speculations. If they are still only of things preconceived, who can affirm that science will not make them real to us to-morrow? By establishing the laws and harmonies of the material world, astronomy prepares us for the conquest of truths of a still higher order.

We can say then plainly that the subjection of natural forces and the reign of man over Nature are only the first fruits of science. It prepares other fruits for its votary of a higher and more precious order. By the beauty of the studies to which it invites him, by the grandeur of the horizons which it opens out to him, and the sublimity of the spectacle it gives him of the laws and harmonies of the universe, it promises to win him away from his present preoccupations, which are perhaps too exclusively positive, and will restore to him under a new form and in an incomparable grandeur that taste for elevated poetry, that enthusiasm for the beautiful, and that reverence for the ideal which are among the most imperious needs of the human soul and which it never abandons without peril.—*Translated for the Popular Science Monthly from the Revue Scientifique.*

It is suggested by a correspondent of Nature as a possible advantage of the want of symmetry in the arrangement of the branches of trees, that the want of synchronism of movement in consequence of it may help prevent their being overturned in times of high wind. He speaks of having watched the branches of a large plane tree during a high gale, when "it seemed incredible that the tree could stand, but for the fact that while one large limb was swaying one way, another would be swaying the opposite way, and so on, all plunging and bending anyhow, with no two in harmony."

SPENCER AND DARWIN.

By GRANT ALLEN.

IT is a familiar observation with people who have reached middle age that their chronological conception of their own time is often far more defective than their chronological conception of written history in which they have not themselves participated. Men of our own generation may remember exactly the relative dates of Pharsalia and Philippi; they may be clearly aware of just how Raphael stood in time to Perugino or to Titian; they may know precisely how long Napoleon, Byron, and Talleyrand survived the Restoration. But about the events of their own lifetime they are always asking themselves, "In what year did Lord Beaconsfield die?" "How long did the Prince Imperial go on living after Sedan?" "Was Carlyle still among us when Mr. Gladstone was denouncing the Bulgarian atrocities?"—and so forth perpetually. Even the sequence of events in one's own life often similarly deceives one. We forget whether Tom went to Australia before or after Lucy's marriage; whether we had or had not made McFarlane's acquaintance at the time when Hingston was engaged in painting his first Academy picture. We remember events, but not their order. Daily facts of life, crowding in upon us too thickly for due note, defy all accurate chronological organization. We recall them disconnectedly; the occurrences impress themselves more or less upon our brains, but their infinite concatenation with all other circumstances escapes us. Hence we are often more surprised at learning a little later how events really stood to one another in our own time than at anything which comes to us from unremembered periods.

Especially is this the case with slow organic or psychological movements—movements which grow unseen, and gain but gradual recognition. Cataclysmal events—the Déchéance of the Second Empire, the Italians in Rome, the assassination of the Czar—often fix themselves by their very vividness and unexpectedness on the memory, with their date and relations ineffaceably attached. But where we have to deal with the growth of opinion, most people fall into serious mental errors of chronology. Either they believe a movement began when they themselves first happened to hear of it; or else they date it from the appearance of some startling and much-discussed publication.

Mr. Edward Clodd's new volume, Pioneers of Evolution, brings this truth into strong relief. In this interesting and careful work Mr. Clodd has been at the pains to investigate thoroughly the part borne in the evolutionary revolution, both by the early precursors—Buffon, Lamarck, Laplace, and others—and by the three

chief actors in the final triumphal stage of the theory, Darwin, Spencer, and Huxley. His analysis is marked by a conspicuous desire for fairness all round: he has honestly endeavored to assign to each of these three great thinkers his own true share—no more, no less—in the genesis of the modern evolutionary concept. Yet, though the book contains, strictly speaking, little on this head that was not already implicitly within the reach of special students of the evolution of evolutionism, it will probably prove a great surprise to that large section of the reading public which habitually confines the idea of evolution to organic development alone, and which still believes that Darwin "invented" the theory of descent with modification. To all such people—and they include the mass of the averagely well-read—Mr. Clodd's revelation will come with all the charm of a sudden surprise. He has been enabled through the kindness of Mr. Herbert Spencer to give fuller and more authoritative details of the fundamental facts than have yet been published; and he shows more fully perhaps than any one else has hitherto done the central importance of Mr. Spencer's position in the evolutionary advance.

May I begin with a passage which I quoted from one of Mr. Spencer's own early works no less than eleven years since, in my little monograph on Charles Darwin? It occurs in an essay on The Development Hypothesis, in that long-defunct paper, the Leader. (The Italics are in the original.)

"Even could the supporters of the development hypothesis merely show that the origination of species by the process of modification is conceivable, they would be in a better position than their opponents. But they can do much more than this. They can show that the process of modification has effected, and is effecting, great changes in all organisms, subject to modifying influences. . . . They can show that any existing species—animal or vegetable—when placed under conditions different from its previous ones, *immediately begins to undergo certain changes of structure fitting it for the new conditions.* They can show that in successive generations these changes continue, until ultimately the new conditions become the natural ones. They can show that in cultivated plants, in domesticated animals, and in the several races of men, these changes have uniformly taken place. They can show that the degrees of difference, so produced, are often, as in dogs, greater than those on which distinctions of species are in other cases founded. They can show that it is a matter of dispute whether some of those modified forms *are* varieties or modified species. They can show too that the changes daily taking place in ourselves—the facility that attends long practice, and the loss of aptitude that begins when practice ceases—the development of every faculty, bodily, moral, or intellectual,

according to the use made of it, are all explicable on this same principle. And thus they can show that throughout all organic Nature there *is* at work a modifying influence of the kind they assign as the cause of these specific differences, an influence which, though slow in its action, does, in time, if the circumstances demand it, produce marked changes; an influence which, to all appearance, would produce in the millions of years, and under the great varieties of conditions which geological records imply, any amount of change."

Now, by most readers at the present day, this passage would undoubtedly be at once set down as "Darwinian." But when was it written? "Would you be surprised to learn" that it was published by Herbert Spencer in the Leader newspaper no less than *seven years* before the appearance of The Origin of Species? The essay which contains it was first printed in 1852; The Origin of Species was published in 1859. As I have already remarked in my Charles Darwin, "This admirable passage . . . contains explicitly almost every idea that ordinary people, not specially biological in their interests, now associate with the name of Darwin. That is to say, it contains, in a very philosophical and abstract form, the theory of descent with modification, *without* the distinctive Darwinian adjunct of natural selection, or survival of the fittest." To put it briefly, most people at the present day, now that evolutionism has practically triumphed, now that the evolutionary method is being applied to almost every form of scientific subject-matter, go doubly wrong as to the origin of that method. In the first place, they attribute mainly or exclusively to Darwin ideas which were current long before Darwin wrote; in the second place, they also attribute to Darwin ideas which were promulgated, in some cases before, and in other cases after Darwin, by independent thinkers who accepted his theories as part only of their own systems. Mr. Spencer has been by far the greatest sufferer from this curious human habit of finding an ostensible figurehead for every great movement, and then attaching everything in the movement to that figurehead alone—Luther for the Protestant Reformation, Rousseau or Robespierre for the French Revolution, Pusey for the Anglo-Catholic revival, and so forth. I am glad that Mr. Clodd has undertaken definitely to combat this doubly erroneous view, and that his book has allowed me the opportunity of adding my mite to this question of ascription.

At the same time, I should like to premise that I write this article in a spirit of the profoundest loyalty to Darwin's memory and opinions. No man could have a deeper respect than I have for the character and the life work of that great man of science. But loyalty, as I understand the term, consists in giving your

hero credit for what he really was and what he really did; it does not consist in attributing to him the work actually done by others, while suppressing the very facts which form his chief claim to the gratitude and consideration of posterity. Now there is one invaluable piece of work which Darwin really did do, and do effectively—he discovered and proved to the hilt the theory of natural selection, as a cause, and probably the chief cause, both of the diversity of species and of their adaptation to the environment. And there are two important pieces of work which Darwin did not do, but with which he is generally credited—he did not originate the idea of descent with modification in plants and animals; and he did not originate the general idea of evolution, as a cosmical process. These last two ideas come to us from elsewhere. That of descent with modification we derive from Erasmus Darwin, Lamarck, and others, following in the footsteps of still earlier vague guessers. That of evolution as a pervading cosmical process we derive from Herbert Spencer, and I venture to say from Herbert Spencer alone. Even the word is Mr. Spencer's; before his time, it was never used, I believe, in that particular sense; and after him, it was seldom employed by Darwin, who used it (when he used it at all) in reference to Mr. Spencer's general concepts. So, too, the phrases, "survival of the fittest," "adaptation to the environment," and others, due entirely to Mr. Spencer, are regarded as a rule by the averagely well-read man as purely "Darwinian." It seems to me, therefore, that to do justice to Mr. Spencer in this matter is also incidentally to do justice to Darwin. For in this place, Darwin, with his inflexible sense of equity, his perfect generosity, his admirable self-effacement, would have been the last man to put forward a claim to what belonged of right to others; and in the second place, with his cautious, experimental English mind, he would never have desired to have his name associated with many of Mr. Spencer's most brilliant and powerful *a priori* achievements.

Nevertheless, before the appearance of Mr. Clodd's book, there were, I believe, but two works extant which endeavored to put this question in its true light, and even there mainly as regarded the theory of natural selection. One of those two books was Mr. Samuel Butler's Evolution Old and New; the other, if I may venture to mention it, was my own small volume on Charles Darwin. But Mr. Butler, both in the work I have just named, and still more in Luck or Cunning, while doing full justice to the precursors and contemporaries of Darwin, has suffered himself to be carried away by a most singular preconception as to Charles Darwin himself, and has represented that most modest and self-effacing of *savants* as deliberately endeavoring to filch for himself the discoveries and achievements of biologists who went before

him. Mr. Butler's books, therefore, though useful as antidotes in the hands of those who understood the facts, could only mislead and puzzle outsiders. Nevertheless, they did actually do this piece of good service: they brought out in strong relief the true nature of Charles Darwin's magnificent life work, as consisting entirely in the establishment of the principle of natural selection —a principle which made the previously discredited notion of descent with modification immediately commend itself to the whole biological world of his time, and more particularly to the younger generation. As to my own little book on Charles Darwin, if I dare to allude to it here, though it also insisted (from the opposite and sympathetic standpoint) upon this same cardinal fact, and likewise dwelt to a somewhat less degree upon the central importance of Mr. Spencer's position, it was published only in a popular series, and did not perhaps reach the eyes of those who mostly required to have these facts impressed upon them. I rejoice, therefore, that Mr. Clodd should have reopened this serious question, and especially that the discussion to which his work is likely to give rise may result in putting Mr. Spencer's true place in the evolutionary movement before the eyes of his contemporaries while he is still among us to be gratified by a recognition too long withheld him.

The needful rectification of public opinion on this subject, it seems to me, embraces two points. In the first place, as regards organic evolution, Darwin was not in any sense the orginator of the idea; he was anticipated by his own grandfather, by Lamarck, by Herbert Spencer (at least so far as priority of publication is concerned), and by several others. In the second place, as regards evolution in general, the idea was not Darwin's at all; it was entirely and solely Herbert Spencer's. Each of these two points I shall treat briefly but separately.

Everybody now knows that the idea of organic evolution— the conception that plants and animals were not miraculously created, but developed by natural causes from a common original —was far older than Charles or even than Erasmus Darwin. In a certain vague way it was anticipated by several early philosophers, and somewhat more definitely, though still nebulously, by Lucretius. In modern times, however, it first took a regularly scientific shape with Erasmus Darwin. Most people believed that the theory never progressed beyond that somewhat amorphous stage up to the time when Charles Darwin published The Origin of Species. This is a serious mistake. The concept, once set on foot, grew rapidly in definiteness and in fullness of scientific basis up to the moment of Charles Darwin's cardinal discovery. With Erasmus Darwin, it was little more than a brilliant though pregnant *aperçu;* with Lamarck, it became a powerfully supported

scientific concept; in Herbert Spencer's hands, it grew to be a probable and rational theory, based upon a serious array of confirmatory facts, and fulfilling all the conditions of a sound working hypothesis. If the reader will turn once more to Mr. Spencer's pronouncement, published seven years before The Origin of Species, he will see that there Mr. Spencer has brought together almost all the chief arguments which still weigh in favor of the theory of descent and modification. Mr. Clodd has collected a large number of passages from Mr. Spencer's early works—especially passages from scattered articles *prior* to the first public hint of Darwin's idea—which amply prove Mr. Spencer's claim to rank as an entirely independent author of the doctrine of organic evolution. The fact is, before Darwin's book appeared, the argument from variation, the arguments from plants and animals under domestication, the argument from embryology, the argument from geographical distribution, the argument from distribution in geological time, had all of them been brought forward, and some of them had been treated with great skill and effect, by Mr. Spencer. Indeed, it was above all von Baer's law of embryological development which led Mr. Spencer both to his first clear conception of the method of biological evolution, and to his first incomplete conception of evolution in general as fundamentally a progress from the homogeneous to the heterogeneous.

Why, then, if so many minds had already grasped the doctrine of descent with modification, did Darwin's immortal treatise produce so immediate and noteworthy a mental revolution? Why did the world which turned a deaf ear to Lamarck, and even to Spencer, listen gladly to Charles Darwin? Clearly, because Darwin had something new and important to add to the concept; and that "something new" was the theory of natural selection. This was Darwin's real contribution to the world's thought. He arrived at it at first as a stray *aperçu;* he followed it up, with Darwinian patience, with astonishing wealth of knowledge and instance, with single-hearted devotion to the particular subject, through the whole of his life; and he left it at the end as nearly certain as such a thesis can ever be made by human intelligence. The weak point in the hypothesis of organic evolution, before Darwin, was the difficulty of understanding the nature and cause of adaptation to the environment. That weak point, when supplemented by theological preconception, made many or most biologists hesitate to accept the nascent theory, in Lamarck's and Spencer's presentment. It is true, minds like Lamarck's and Spencer's could never for a moment, on the other hand, have accepted the crude and unthinkable dogma of separate creation; but the mass of biologists, incapable of high philosophic reasoning, held their judgment suspended, and waited for some other

explanation of the origin of species. Darwin's discovery converted them *en bloc*. It was easy to understand, by means of the clew he afforded, not merely *that* organisms had been naturally evolved from simple primitive forms, but also *how* and *why* they had been so evolved. Darwin's great work, then, consisted in this—that he made credible a theory which most people before him had thought incredible; that he discovered a tenable *modus operandi* for what had before been rather believed or surmised than definitely imagined.

I do not mean to say that Darwin did no more than this. He supplied the great key of natural selection; but he also added much in other ways to the doctrine, especially in the direction of piling up facts and meeting objections. His work had thus a double value. On the one hand, it is not probable that the general biological public would have been converted to evolutionism half so quickly if it had not been for the enormous mass of confirmatory evidence adduced by Darwin. In the second place, even those who, like Spencer, were already evolutionists—evolutionists in fiber, incapable of taking any supernaturalist view of the universe in which they lived—gladly availed themselves of Darwin's discovery of natural selection, as an explanation of one important set of features in organic evolution, thitherto most imperfectly and inadequately explained. Or, let us put it another way. From the point of view of contribution to thought, it is natural selection that forms Darwin's great glory. But from the point of view of mere effective persuasion, it is the weight of evidence he brought up in favor of the older principle of descent with modification that told and still tells with the average mind. Hence it has happened, and perhaps will always happen, that Darwin has received more credit for that part of his theory which was not of his own invention than for that part of which he can justly claim the almost exclusive glory. Almost, I say, because the modifying adverb is demanded by justice to Mr. Alfred Russel Wallace, whose partial coincidence with Darwin in the discovery of natural selection now needs no advertisement.

As thinker, then, it is on natural selection as a *vera causa* of specialization and adaptation among plants and animals that Darwin most securely rests his claim to celebrity. As prophet and apostle, on the other hand, it must be frankly admitted that he ranks first as a preacher of organic—but only of organic—evolution. In this respect, his importance, in England especially, can hardly be overrated. For it is a peculiarity of the practical English mind that it is more moved by a vast array of evidence, a serried mass of cumulative instances, than by any possible cogency of logical reasoning. Darwin's own mind was in this way intensely English. He piled up fact after fact, added case

to case, till men whom no power of abstract argument could convince were convinced by pure force of successive witnesses. They were borne down by numbers. Your ordinary Englishman, indeed, is never quite satisfied by Euclid's demonstration that in a right-angled triangle the square on the hypotenuse is equal to the sum of the squares on the two opposite sides; he honestly believes it when he sees it tried a hundred and twenty times by careful measurement, and still more when he finds that engineering works which take it for granted as a basis succeed in paying a satisfactory dividend. Proof that in the nature of triangles this truth is involved he does not regard; experimental verification, or what seems to be such, in a few concrete cases, amply satisfies him. Hence it came about that a world which would have listened coldly to Herbert Spencer's *a priori* reasonings or splendid generalizations was converted at once when Darwin brought up with inexhaustible patience and extraordinary keenness of insight his profound array of confirmatory facts about bees and cuckoos, about the fertilization of orchids and the movements of tendrils.

Nobody has better summarized than Mr. Clodd the exact point which evolutionary theory had reached as regards plants and animals *before* the publication of The Origin of Species. Whoever wishes to learn just how much was surmised by the predecessors of Darwin, and just how much Darwin added to their ideas, can not do better than consult his luminous exposition.

Once, indeed, no less than seven years before the publication of The Origin of Species, Mr. Spencer even trembled for a moment on the verge of the actual discovery of natural selection. This was in the essay on population in the Westminster Review in 1852. The passage at full is too long to extract; but I will quote the last words of it. "All mankind subject themselves more or less to the discipline described; they either may or may not advance under it; but in the nature of things only those who *do* advance under it eventually survive. For, necessarily, families and races whom this increasing difficulty of getting a living which excess of fertility entails does not stimulate to improvements in production . . . are on the high road to extinction; and must ultimately be supplanted by those whom the pressure does so stimulate. . . . And here, indeed, it will be seen that premature death, under all its forms, and from all its causes, can not fail to work in the same direction. For as those prematurely carried off must, in the average of cases, be those in whom the power of self-preservation is the least, it unavoidably follows that those left behind to continue the race must be those in whom the power of self-preservation is the greatest, must be the select of their generation." Now, this is the doctrine of natural selection,

or, as Mr. Spencer himself afterward called it, survival of the fittest. Only, it is limited to the human race; and it is not recognized as an efficient cause of specific differentiation. As Mr. Spencer himself remarks, the passage "shows how near one may be to a great generalization without seeing it." Moreover, Mr. Spencer here overlooks the important factor of spontaneous variation, which forms the corner-stone of Darwin's discovery, and which was also clearly perceived by Mr. Wallace. In short, in Mr. Spencer's own words, the paragraph "contains merely a passing recognition of the selective process, and indicates no suspicion of the enormous range of its effects, or of the conditions under which a large part of its effects are produced."

It is thus obvious not only that Mr. Spencer was a believer in organic evolution long before the publication of Darwin's first utterance on the subject, but also that he almost succeeded, like Wallace, Wells, and Patrick Matthews, in anticipating the discovery of natural selection.

But, besides the misconception about Mr. Spencer's relation to Darwin as regards organic evolution, there remains the far deeper and more fatal misconception about his relation to Darwin as regards evolution in general, viewed as a cosmical process. Most people imagine, I gather, that Mr. Spencer is a philosopher who has put into a higher and more abstract form Darwin's discoveries and theories. In short, they regard him as a disciple of Darwin. And this brings me to the second of the two rectifications of public opinion which I promised above to attempt. Nothing could be more absurdly untrue than to regard Mr. Spencer as in any way or in either department a disciple of Darwin's. In the first place, as regards organic evolution, he was an avowed evolutionist long before the publication of Darwin's first hint on the subject. He continued an evolutionist, in the main on the same lines, after Darwin had brought out The Origin of Species and its ancillary volumes. He adopted, it is true, the theory of natural selection, as did every other evolutionist of his time (except Mr. Samuel Butler), but he adopted it merely as one among the factors of organic evolution, and, while valuing it highly, he never attributed to it the same almost exclusive importance as did Darwin himself—certainly not the same quite exclusive importance as has since been attached to it by the *doctrinaire* school of Neo-Darwinians, who employ it as the sole key which unlocks, in their opinion, all the problems of biology. On the contrary, he has always steadily maintained the existence and importance of other factors in organic evolution, and has combated with extraordinary vigor and acuteness the essentially Neo-Darwinian views of Weismann which make natural selection alone into the *deus ex machina* of organic development.

In the second place—and this is the more important point—as regards evolution at large, Mr. Spencer is not in the remotest degree beholden for the origin of his ideas to Darwin. So far as those ideas are not quite original with him—and no human idea is ever wholly original—they are derived from the direct line of Kant, Laplace, and the English geologists. For many years previous to Mr. Spencer's philosophic activity the progress of human thought had been gradually leading up to the point where a cosmic evolutionism such as Mr. Spencer's became almost of necessity the next forward step. But to say this is not to detract in any way from Mr. Spencer's greatness; rather the other way; for it needed a man of cosmic intellect and of cosmic learning to make the advance which had thus become inevitable. The moment had arrived, and waited for the thinker; Mr. Spencer was the thinker who came close upon the moment. The situation is this: Kant and Laplace had suggested that suns and stars might have grown and assumed their existing distribution and movements by the action of purely natural laws without the need for direct creative or systematizing effort from without. The geologists had suggested that the crust of the earth might have assumed its existing stratification and sculpture through the agency of causes at present in action. Erasmus Darwin and Lamarck had suggested that plants and animals might have been developed and specialized from a common original by the direct action of the environment, aided in part by their own volition, where such existed. But all these thinkers, great and able in their day, had addressed themselves—as Charles Darwin later addressed himself—to one set of phenomena alone; had regarded the process which they pointed out, in isolation only. It remained for a man of commanding intellect and vast grasp of generalizing faculty to build up and unify these scattered evolutionary guesses into a single consistent concept of evolution. Herbert Spencer was that man. He gave us both the concept and the name by which we habitually know it. The words "theory of evolution" occur already, seven years before Darwin, in the Leader essay.

This point, again, Mr. Clodd has excellently elaborated. "Contact with many sorts and conditions of men," he says, "brings home the need of ceaselessly dinning into their ears the fact that Darwin's theory deals only with the evolution of plants and animals from a common ancestry. It is not concerned with the origin of life itself, nor with those conditions preceding life which are covered by the general term, inorganic evolution. Therefore it forms but a very small part of the general theory of the origin of the earth and other bodies, 'as the sand by the seashore innumerable,' that fill the infinite spaces." It is evolution

in general, both the concept and the word, that we owe to Mr. Spencer; and Mr. Clodd's book brings into strong relief the actual relations existing in this respect between Herbert Spencer himself and his predecessors or contemporaries.

The genesis of the idea in his own mind Mr. Spencer has illustrated by a series of extracts from his original volume of Essays, published previously to The Origin of Species, and therefore necessarily independent of any Darwinian impulse. The series of extracts thus selected he has permitted Mr. Clodd to print entire, and with them the abstract supplied to Prof. Youmans. These summaries I will not still further summarize; it must suffice here to note, for the benefit of those who have never considered dates in this matter, that the chronology of the subject is roughly as follows: In 1859 (almost 1860, for it was in the end of November) Darwin brought out The Origin of Species. Before that period Mr. Spencer had published (among others) the following distinctly evolutionary works: In 1850, Social Statics, in which the idea of human evolution was clearly foreshadowed; in 1852, an article in the Leader on The Development Hypothesis (from which I have quoted a passage already), where the evolution of species of plants and animals was definitely set forth; in 1854, an article in the British Quarterly Review, on The Genesis of Science, where intellectual evolution was distinctly mapped out; in 1855, The Principles of Psychology (first form), where mental evolution is fully formulated, and the development of animals from a common origin implied at every step; in 1857, an article in the Westminster Review, on Progress, its Law and Cause, where the conception of evolution at large was finally attained (though not quite in the full form which it afterward assumed). From all of these, but especially the last, grew up the idea of the System of Synthetic Philosophy, the first programme of which was drawn up in January, 1858, nearly two years before the appearance of The Origin of Species. Thus so far is it from being true that Mr. Spencer is a disciple of Darwin that he had actually arrived at the idea of organic evolution and of evolution in general, including cosmic evolution, planetary evolution, geological evolution, organic evolution, human evolution, psychological evolution, sociological evolution, and linguistic evolution, before Darwin had published one word upon the subject.

To some people, in saying all this, I may seem to be trying to belittle Darwin. Not at all. You do not belittle a great man by giving him full credit for what he did, and none for what he did not do. You do not belittle Virgil by showing that he was not the powerful magician the middle ages thought him; nor do you belittle Bacon by proving that he did not write Othello and Hamlet. Nobody has a greater respect for Bacon, I believe, than Dr. Abbott;

but Dr. Abbott does not think respect for Bacon compels him to father Macbeth and Julius Cæsar upon the author of the Novum Organum. Nobody has a greater respect for Darwin than I have; but I do not think that that respect compels me to credit Darwin with having originated the ideas due to Lamarck and to Herbert Spencer. Nay, more; I have so deep a respect for the work Darwin actually performed that I consider it quite unnecessary to filch from others in order to enrich him. He can well do without such disloyal friends. Indeed, it is Mr. Samuel Butler's peculiar belief that Darwin did so attempt to filch on his own account. I can not agree with Mr. Butler that the honestest and most candid of our biological thinkers ever made any such endeavor himself; nor can I believe one honors him by making it for him.

If I were to sum up the positions of these two great thinkers, Darwin and Spencer, the experimentalist and the generalizer, the observer and the philosopher, in a single paragraph each, I should be tempted to do it in somewhat the following fashion:

Darwin came at a moment when human thought was trembling on the verge of a new flight toward undiscovered regions. Kant and Laplace and Murchison and Lyell had already applied the evolutionary idea to the genesis of suns and systems, of continents and mountains. Lamarck had already suggested the notion that similar conceptions might be equally applied to the genesis of plant and animal species. But, as I have put it elsewhere, what was needed was a solution of the difficulty of adaptation which should help the lame dog of Lamarckian evolutionism over the organic stile, so leaving the mind free to apply the evolutionary method to psychology, and to what Mr. Spencer has well called the supraorganic sciences. For that office Darwin presented himself at the exact right moment—a deeply learned and well-equipped biological scholar, a minute specialist as compared with Spencer, a broad generalist as compared with the botanists, entomologists, and ornithologists of his time. He filled the gap. As regards thinkers, he gave them a key which helped them to understand organic evolution; as regards the world at large, he supplied them with a codex which convinced them at once of its historical truth.

Herbert Spencer is a philosopher of a wider range. All knowledge is his province. A believer in organic evolution *before* Darwin published his epoch-making work, he accepted at once Darwin's useful idea, and incorporated it as a minor part in its fitting place in his own system. But that system itself, alike in its conception and its inception, was both independent of and anterior to Darwin's first pronouncement. It certainly covered a vast world of thought which Darwin never even attempted to enter. To Herbert Spencer, Darwin was even as Kant, Laplace, and Lyell

—a laborer in the special field who produced results which fell at once into their proper order in his wider synthesis. As sculptors, they carved out shapely stones, from which he, as architect, built his majestic fabric. The total philosophic concept of evolution as a cosmical process—one and continuous, from nebula to man, from star to soul, from atom to society—we owe to Herbert Spencer himself, and to him alone, using as material the final results of innumerable preceding workers and thinkers.—*Fortnightly Review.*

ANTS AS THE GUESTS OF PLANTS.

By Prof. M. HEIM.

THE relations of ants with aphides and other insects have been studied by several authors, and constitute a field of interesting observation. The best known are those with the aphides and the cochineals, from which ants derive a food of honeydew. Where these do not abound, certain hemipterous insects take their place. Thus the caterpillar of the *Lycæna* is said to bear on its latter abdominal segments three or four pairs of projecting pimples with a central opening whence little drops of a special liquid exude under the caresses of *Formica fusca*. It is believed, further, that ants assist these insects in their molting by helping them get rid of their old skin. It seems to be established that ants protect some insects injurious to vegetation against the attacks of their enemies; in some cases, however, it is probable that they often take juice-sucking insects from young and tender parts to other, older parts of the plant, where they will do less harm, and thus in a measure protect the plant. Ants have been observed thus transporting aphides.

All insects producing nectar may be regarded, as a whole, as ambulatory nectaries. They are more powerful causes of attraction to ants than the extrafloral nectaries. Scattering themselves nearly all over the surface of the plant, they determine the coming and going of the ants, which indirectly protect the whole plant. Yet the damage done by the "ambulatory nectaries," which extract the nutritive juices from the plants and cause deformities in their organs, can hardly be said to be compensated by the incidental and uncertain protection which the ants may afford them in other respects.

The ants which are really protective to plants are not those which obtain their food (indirectly for the most part through the aphides) from the vegetable kingdom, but those which are really carnivorous. These are numerous in temperate climates, and their usefulness to agriculture and sylviculture is incontestable,

Thus the field ant is a great insect destroyer. A nest of this species is capable of destroying as many as twenty-eight caterpillars and grasshoppers a minute, or sixteen hundred an hour; and such a colony is at work day and night during the pleasant season. In the arid plains of America the beneficent work of ants is revealed in the isles of verdure around their hills.

There are plants hospitable to ants, which furnish them shelter and often food, within the cavities of which the instincts of the ants prompt them to take their abode. This is the case with several ferns, among them the *Polypodium nectariferum*, the sterile fronds of which bear nectaries on their lower face, and are, moreover, of a shape favorable to sheltering the insect.

Some palm trees, whose young shoots are very tender and insufficiently defended by their only half-hardened thorns, furnish shelter to ants and receive protection from them: the *Calamus*, in its spathe; some species of *Dæmonorops*, in a sort of galleries on the surface of the stem, formed by the intercrossing of the incurved thorns with which the stalk is invested. In this case the sheltering organ forms only a part of the walls of the cavity inhabited by the ants; but in the large majority of cases the cavity is entirely formed by the organs of the plant.

From the examination of a large number of cases of sheltering trees frequented by ants, we draw the conclusion that the biological relations between plants and these insects were primitively as simple as possible, being those of plants devoured and insects devouring. Such are the real relations of the harvesting ants and the leaf-cutting ants with the plants which they ravage. It is, however, important to observe that the plants harvested from by ants do not suffer without drawing a kind of advantage from the harvesting. Numerous seeds are sacrificed; but a large number, escaping the voracity of the ants, are scattered by them and owe them for a veritable assistance in the struggle for existence with rival species.

In the complete industry of ants they do not content themselves with the simple harvesting of vegetable products, but devote themselves to agriculture; and the plants cultivated by them are, by means of the care they receive from them, favored in their struggle with rival species in the same way as the cereals cultivated by man, which have no longer to contend with indigenous species. Numerous ants content themselves with sweet, liquid substances, as honey and nectar. Primitively, they had to satisfy themselves with gathering the honey scattered over the surface of the leaves; then their suction, localized at special points on the leaves, may perhaps have determined the formation of extrafloral nectaries. These are susceptible of rendering the plants two sorts of services. Ants attracted by them to the sur-

face of the plant protect it against the attacks of leaf-eaters; and, further, the extranuptial nectaries divert the ants from the reproductive organs, where they might, in some flowers, rob winged insects, aids to fertilization, of the nectar, without themselves aiding in the pollination.

The protection of the floral nectaries may, however, perhaps be assured by other arrangements still more efficacious and more economical to the plants. The plant, becoming myrmecophobic and protecting its floral nectaries against ants, achieves an economy of nutritive forces. *Chevaux de frise*, gliding surfaces, bent peduncles, and viscous hairs are the principal defensive provisions against ants.

The sweet extract of aphides, cochineals, and some other insects may be likened to a real animal honey. Hence the origin of the pastoral customs of ants, the establishment of underground and open-air stables, and the effective protection of aphides against their enemies, with the real injurious action of ants to a number of plants.

The instinct of ants leads them to lodge themselves in cavities capable of offering them shelter. Such cavities will be more advantageous to them as they are within reach of the food they seek. Thus, a nectariferous plant visited by ants will soon become a host-plant to them, if it offers a cavity suitable for their accommodation. Such is also the case with a plant not nectariferous, but inhabited by insects that can supply ants with an animal nectar. Ants will then devote themselves to the rearing of those insects in the hospitable cavity. In some cases also, the plant, finding a real advantage in the presence of ants on its surface, differentiates *food bodies* adapted to furnish them a more abundant nourishment.

The services rendered to plants by ants are of various kinds. In numerous cases ants effectually protect the host-plant against the attacks of parasitical insects or the teeth of herbivorous animals; in host-plants with cavities converted into stables ants may attenuate the damage committed by aphides or cochineal insects by removing them from the young organs when their presence would be injurious to a point where it is more compatible with the life of the plant. There is established a kind of symbiosis of these—the ants protecting their cattle which furnish them food, and diminishing the damage occasioned by the herds to the plant on which they feed. Sometimes, but rarely, the refuse material accumulated by the ants in the sheltering organs of the plant seems capable of furnishing it with nutritious matter; but this has yet to be proved in most cases.

The irritation produced by the ants upon the sheltering organ may, by determining a more or less notable increase of that organ,

aid the host-plant in the struggle which it has to sustain, either against rival species or against physical agents.

The prime origin of the host-organ is really variable, according to the types considered. Sometimes ants take advantage of cavities wholly or incompletely closed which are a part of the morphological plan of the plant, and the function of which can only be mechanical, such as hollow internodes; sometimes they convert into ants' nests organs that serve to protect plants against herbivorous animals—thorns; or against physical agencies—reservoirs of water.

In other cases the parasitical origin of the host-organ does not seem doubtful. In some types it may be contrived by the ants in view of their wants—perforation of the wall, formation of galleries; in other cases primarily abnormal dispositions determined by the presence of ants in the host-organs seem to become, through heredity and selection, normal organs; ants then find host-organs all ready to receive them, without their having to perform any labors preliminary to putting them to use. Dispositions favorable to ants are therefore of multiple origin, varying according to the case.

The biological relations between plants and ants come thus, by insensible degrees, to affect the complex characteristics of life in common, to reciprocal advantage—symbiosis.

If we examine the phenomena of the world with the eyes of the ancient naturalist we shall not fail to admire greatly the various means employed by Nature to reach its ends. Regarding the relations of ants and plants with reference to the reason for the existence of biological peculiarities, we shall not be able to appreciate too much the providence which gives ants access to nourishing plants, and furnishes some plants with guests capable of giving them protection in exchange for some small services.

Does it not seem as if each species was created for the destruction of some other one, and that the life of so many individuals of opposing tendencies should ultimately result in the destruction of all that is living on the surface of the globe? Yet strangely from the struggle itself is born accord; the antagonism of beings culminates in symbiosis, instability in equilibrium, death in life. Chaos engenders order. The resultant of these extensive contests, although most usually not appreciable to the eye not forewarned, may be summarized in the word harmony. Perfect accord is established between beings that have nothing in common, precisely in consequence of the diversity of their wants; for in this accord none of the concordants has an interest in despoiling its associate.

By this the law of progress is certainly confirmed as to what concerns general life. Aside from the sufferings and the death of

individuals, evolution tends to establish among beings primarily rivals—a *modus vivendi* which insures the free expansion of their species—an expansion progressive, but which will eventually find its limits in the new struggle which species, triumphant through their union, will have to sustain against adjacent species.

What horizons does the study of ants open to the mind of the naturalist! The scrutiny of their relations with plants is sufficient to procure for the investigators who devote their efforts to it the most lively enjoyment which the naturalist's mind can ask for. Those who have succeeded in raising this little corner of the veil of Nature should be ever grateful to the ants for it.—*Translated for the Popular Science Monthly from the Revue Scientifique.*

THE LANGUAGE OF CRIME.

By A. F. B. CROFTON.

THE language of criminals—the *argot* of Paris, the "patter" of London—has been carefully investigated by numerous writers, with very variant results.

Its origin is difficult to explain. Criminals, say many authors, have found it necessary to adopt a technical language for their own protection, that they may be able to converse in public without being understood. "They have been forced to do this, and have made a language as sinister and as vile as themselves." This theory can not be admitted. Certainly the *argot* is sinister and vile and thoroughly representative of the class that uses it, but further than this we can not go.

The theory that the use of this dialect is of any assistance to the criminal is inadmissible. Most policemen and all prison officers know this slang, sometimes better than the thieves. To speak it in the hearing of a detective is to invite arrest; to speak it in the presence of the general public would arouse suspicion and attract attention—two things which are especially to be avoided. Why, then, does it exist? Dr. Laurent, of the Santé prison in Paris, has given an explanation which has at least nothing to contradict it: The persons engaged in every trade form a species of dialect or technical phraseology which is spoken and understood only by themselves. Criminals, who practice a trade as old as any, have gradually acquired a language more adapted to their wants, more in keeping with their ideas and thoughts. Miserable, heartless, engaged in a perpetual struggle against morality, law, and decency, they have acquired a language of debased words and cynical metaphors, a language of abbreviated expressions and obscene synonyms.

Many authors have found it analogous to the elementary language of primitive peoples, and the frequent onomatopes give some apparent solidity to this theory. The describing of a subject by one of its attributes is characteristic of all early races and even to-day of children. The child who describes a dog as a "bow-wow" is following a primitive instinct. The infant may call a train a "poo-poo," an onomatopoetic expression for its puffing; the thief calls a train a *rattler*. The analogy is not complete but suggestive. Its very incompleteness illustrates exactly the objection to the theory stated above. The child creates, but the thief adapts. The slang of the criminal is not a creation of a primitive language; it is the attempt to reduce a matured language to an elementary stage. It is a destructive and not a creative process.

Notwithstanding the able arguments of the theorists referred to, the observer can not but remark the very serious difficulties that arise when we attempt to consider the *argot* of the thief as a primitive language, tongues "which are always serious, never ironical, never mirthful, never seeking to sully the object of the thought, simple in their metaphor, abundant in grammatical forms." Every language has a syntax peculiar to itself, but in the *patois* of the criminal no attempt is made of changing anything but the lexicon. It bears the same resemblance to the parent language that a pile of cogwheels does to a watch. They are not a watch, but neither are they a new machine. Thus we must regard the *argot* only as a dialect in which debased terms replace the words of the parent tongue, in which the innate laziness of the criminal has effaced all words of any length and has simplified the pronunciation wherever the correct form requires anything but an elementary combination of sounds.

Let us examine some of these transformations and synonyms.

The general tendency of the criminal to reduce the abstract to the concrete, to denote the substantive by one of its attributes, is shown very clearly in his synecdochical phraseology. Thus a purse is a *leather;* a street car is a *short,* comparing its length with a railroad car; a handkerchief is a *wipe;* and a pair of shoes *a pair of kicks.*

Again, some of the terms appear to be purely arbitrary, and, were it not that the creative power is absent in criminals as in women, I should not hesitate to state it as a fact. But it seems wiser to conclude merely that the origin of these terms has become obscured. To suppose that they were created would be in too distinct contradiction to all obtainable evidence, indirect though it may be. Such expressions are *to kip,* meaning to sleep; *to spiel,* to make a speech; *jerve,* a waistcoat pocket; *thimble,* a watch; *to do a lam,* meaning to run.

Some of the expressions are very descriptive. To run from a police officer is *to do a hot foot.* A person who is always listening to other people's conversation is called a *rubber-neck.* The word *push,* meaning a crowd, is occasionally seen in the newspapers. To be arrested is to be *pinched;* to be convicted is to *fall.* To refuse a person's appeal is *to give him the marble heart.* Such expressions require no explanation.

There is a disposition among all uneducated people to use a single verb both in a transitive and an intransitive sense. The verb "to learn" is used very commonly for "to teach." "To set" is used for "to sit," and "lay" for "lie." In the *argot* the same rule applies. The verbs to kill and to die are both expressed by the one term "*to croak,*" and the grim humor of the class appears in the word *croaker,* which means doctor. The *argot* has no syntax; in the verbs there is scarcely any distinction of tense. The present tense is used for the imperfect and for the past. "I win a dollar" may mean I am winning a dollar, but it is equally probable that it means I won a dollar or I have won a dollar. There seems to be an effort to eliminate everything possible from the language, to reduce its vocabulary to the minimum. It is a natural endeavor for a listless and enervated people. In some cases there may be an attempt to use the past form of the verb, but the formation is very apt to be incorrect, although regular. Thus the grotesque terms used by children as "bringed," "catched," and even strange plurals and comparatives as "foots" and "worser," are very commonly found.

This dialect has, as we have been shown, mutilated the mother tongue; it has also borrowed liberally from other languages, but without method or etymology. Criminals are not grammarians. Neither are they linguists, and at first sight it would seem strange that they should import words from other countries. We will find, however, that in any prison the percentage of inmates of foreign birth will be large; in America it is about fifteen per cent. A foreign expression which seems apt or an improvement on the one in present use is rapidly diffused through the prison. In cases where it is especially descriptive it may become permanent, but its life is usually short. The *argot* of the crime class changes materially every two or three years. It is ephemeral, as shifting as its users. Victor Hugo exaggerates only slightly when he says, "The *argot* changes more in ten years than the language does in ten centuries."

This mutability is common to all languages, but recognized tongues change more slowly—in a generation, not in a year. Words are born, live, and die as we do. They have their youth, their virility, their old age, and their second childhood. They have a reason, there is an element of reflection which

precedes their introduction, while in the *argot* the birth of a new word is a chance. Thus in the last three years there have been three different words for watch—*super*, *thimble*, and *yellow and white*—each of which was, in its turn, the only term used.

Every writer on the subject has noticed that the *argot* is very rich in expressions to denote certain common actions. This is a peculiarity shared by all primitive languages, the only difference being in the selection of the common acts. Thus in Sanskrit there are nearly one hundred roots which express the idea of killing or wounding, without counting secondary derivations. Some of these roots are embodied in our language to-day. In the dialect of the thieves there are nearly one hundred expressions to signify theft. It was necessary for the pickpocket to describe the various pockets in a man's clothing and in a woman's dress. The average man does not often need to specify a particular pocket; when he does, he lays his hand on it to assist the poverty of his language; the thief has a separate name for each separate pocket.

It is a curious and instructive study, full of interest to the metaphysician, the philosopher, or the scientist.

But in spite of this richness in synonyms, which is in itself a very marked sign of degeneracy, for the tendency of a language is to eliminate its synonyms, giving to each a different shade of meaning, the *argot* is a poor language. It has not a single expression for abstract emotion; to attempt to render a philosophic thought, a moral emotion, a synthetic or æsthetic idea into the dialect of the thief would be like attempting to translate "electricity" or "steam engine" into Latin. It is impossible, because the words do not exist. They are not needed. The criminal has no more conception of abstract emotion than a blind man has of color.

A fact which does seem to ally the *argot* to a primitive language is its ability to form additional words from its own resources, a power of self-development which we find in the old Anglo-Saxon and especially in the German of to-day. This trait is the more striking, as it seems in direct contradiction to the impotence of the English language in this respect. The English has little formative power; it relies on the Greek and Latin languages for the extension of its vocabulary.

Dr. Laurent states, in his work on the French criminal, that some authors have claimed that the slang of the criminal was a kind of international language for thieves, a Volapük of crime. It is unfortunate that the names of these authors were not given. Were it not for the reputation of the learned doctor it might be suspected that he was creating men of straw that he might forth-

with demolish them. The claim is almost too absurd to discuss. Even in different parts of the same country the dialect of the local criminals will differ very materially, while in all cases it would be totally incomprehensible to a foreign thief.

SKETCH OF STEPHEN J. PERRY.

THE Roman Catholic priesthood of the present century bears upon its rolls the names of several men who have distinguished themselves in scientific research; among them are those of two who were eminent in the study of solar physics. One of these was Father Secchi, of Rome; the other was Father Perry, S. J., who for several years maintained the position of Stonyhurst College and Observatory as a leading institution in the investigation of the sun spots, the aurora borealis, electric and magnetic currents, and the phenomena associated or supposed to be associated with them.

STEPHEN JOSEPH PERRY was born in London, August 23, 1833, and died on the steamer Comus, of the British Eclipse Observing Expedition, near Demerara, December 27, 1889. He was taught at Gifford Hall School, and trained for the priesthood of the Roman Catholic Church in the colleges at Douai and Rome. Returning to England, he became, in November, 1853, in accordance with a resolution which he had formed while in Rome, a member of the Society of Jesus, British Province. At the end of the second year of his novitiate he went to France. Returning to the seminary of Stonyhurst, at Blackburn, England, he began a course of philosophy, but, showing a marked predilection for mathematics, his studies were, with the advice and consent of his superiors in the order, turned especially in that direction. He took a high rank in mathematical honors at the University of London, attended lectures by De Morgan, and completed his mathematical studies in Paris. He was then appointed Professor of Mathematics and Director of the Observatory in Stonyhurst; taught a class there for one year; took a course in divinity at St. Bueno's College, North Wales; was ordained priest in 1866; and two years afterward resumed his professorship and the direction of the observatory at Stonyhurst, where he spent the whole of the rest of his life except when absent upon some scientific expedition.

The observatory at Stonyhurst, where good work in meteorological and magnetic observation had already been done, was chosen as one of the first-class English meteorological stations in 1867. With the new instruments that were acquired from time to time, giving the observatory an excellent equipment, Father Perry strove to make the station one of the most efficient,

particularly in the study of solar physics. "His first communication to the Royal Astronomical Society," says Nature, upon whose obituary notice of Father Perry we rely for most of our material, "indicates the policy he pursued—to undertake no work which was a mere duplication of that done at other places." It appears, from a summary of his solar work during the ten preceding years, given at a lecture at the Royal Institution in May, 1889, that it was carried on by means of drawings and spectroscopic observations. "For the drawings an image of the sun ten inches and a half in diameter was projected on a sheet of drawing-paper affixed to a sketch board carried by the telescope, and all markings on the sun traced. The drawing finished, the chromosphere and prominences were examined with the spectroscope. About two hundred and fifty drawings were made every year from 1880. The results of these observations were published annually in a neat little volume, and in various publications." Regular observations of Jupiter's satellites and of comets were also made, and spectroscopic observations of comets and stars. In the year 1888, for instance, the chromosphere was completely examined on eighty-four days and partly on three other days. The Rev. Aloysius L. Cortie, S. J., in his biography of Father Perry (London, Catholic Truth Society), describes the work at Stonyhurst as having included the daily drawing of the sun when possible, the measurement of the depth of the chromosphere, the heights of prominences, and observations of sun-spot spectra—a programme which was faithfully adhered to up to the time of Father Perry's death. The drawings of the sun spots, as they appeared in the Memoirs of the Royal Astronomical Society, reproductions of two of which are given in Father Cortie's book, show how much can be effected by means of the pencil. The main object of making these drawings, which are of great importance and supplement the solar photographs, was to throw light upon the theories of the mode of formation of spots, and to find, if possible, the clew to the connection between terrestrial magnetism and solar activity.

Father Perry's industry and strict attention to his work of observation are further attested in his contributions to Nature and other journals. In Nature, the only journal of which we have complete files at hand, we find from one to three communications each in twenty-three of the forty volumes which were published previous to his death, recording phenomena of weather, magnetism, the aurora borealis, meteors, the sun, and earthquakes. The first volume, for instance, has a communication describing the cyclone of January 13, 1870, as it prevailed at Stonyhurst. In the third volume are letters speaking of his having missed on some observation a particular faint yellow line in the chromo-

sphere, on the November meteors, and describing minutely the successive phenomena of the earthquake of March 17, 1871. A communication in the second volume sets forth a method of magnetic surveys of limited districts in which investigators might employ themselves during their vacations, and which he had practiced satisfactorily during two successive vacations. These were probably the survey of the west of France, made in 1868 in company with Father Sidgreaves, and that of the east of France, made in 1869. A detailed account of such a survey made by him in Belgium one autumnal season was communicated to the Royal Society, with the magnetic elements of twenty stations and the secular variation. Other studies on this subject are recorded; one comparing the curves as shown by the photographs in terrestrial magnetism at Stonyhurst and Vienna, which was spoken of as remarkable in that the curves offered a striking illustration of the simultaneous action of the disturbing forces of two magnets many miles apart; and observations by him and Prof. Balfour Stewart on the regular fluctuations of declination at Stonyhurst and Kew, of which the authors remarked that "such fluctuations almost always occur as couplets or groups of couplets—a couplet meaning first a descent and then an ascent, or the reverse"; and the paper offered an explanation of the phenomena. A communication on the magnetic storm of October, 1872, calls attention to the importance of observations of such manifestations, in view of the coincidences discovered between them and other important natural phenomena.

In an address delivered in 1872 or 1873 to the Liverpool Polytechnic Society, after explaining what was known of terrestrial magnetism and remarking upon the observed coincidence of magnetic disturbances with the passing of earth currents, "their never-failing appearance at all auroral displays, their simultaneous appearance at places the most remote from each other, and their agreement in various periodic features with outbursts of sun spots," were spoken of as most powerful aids to the solution of the problems connected with them; and he suggested that it was not unreasonable "to expect that some light may be thrown upon the question, if we examine with careful attention the not impossible connection of magnetic storms with solar outbreaks, or with volcanic eruptions and violent earthquakes, with the variations of the wind, or even with the showers of fallen meteors." Further, he asked, if the connection supposed by certain students between the period of solar spots and the relative position of the planets can be maintained, "if the solar disturbances are in any way due to the combined action of the planets, and these again are found to be coincident with the great perturbations of terrestrial magnetism, shall we not be inclined to attribute a wider range to the

magnetic force than is in general assigned to it? May not that which has long been allowed to rank among the most extensively diffused of Nature's agents find a home in each individual member of the solar system, causing them to act and react upon each other as well by their magnetic energy as by the force of gravity? The perfect solution of such a problem would well repay many a year of persevering observation and of assiduous study, and well will those be rewarded by whose labor the general cause of terrestrial magnetism ceases to be one of the unsolved mysteries of cosmical physics."

In connection with the eclipse of December 22, 1870, Father Perry was made chief of the expedition to watch the phenomenon at Cadiz, Spain. Unfavorable weather prevailing during most of the time of the sojourn of the party at the station, the observers were spread out as much as possible, in hopes of not failing altogether, and the results justified expectations. The clouds were not so thick as to cut off all the observations, and some fairly good views were obtained.

For the observation of the transit of Venus of 1874 Father Perry offered his services for the expedition to Kerguelen Island, and was appointed chief of the observing party, to be stationed at Christmas Harbor. Importance was attached to this expedition in British scientific circles aside from its astronomical purposes, because this lonely "island of desolation," as Father Perry afterward called it, had been but little explored, and not much was known of the region in which it was situated; and a natural history party was sent out with the transit company by the Royal Society to investigate the botany, etc., of the island. The undertaking to go on this voyage was a serious adventure with Father Perry, and illustrates as much as anything else, perhaps, his self-sacrificing devotion to his favorite science. He was peculiarly sensitive to suffering from seasickness, and was not spared on this, one of the longest and roughest voyages the ocean affords; and his sufferings on this occasion, Nature says, "were so fearful that every one wondered that he cared to venture on even the most promising trip." His patience in suffering "helped to win for him the esteem of the officers with whom he came in contact. Not one word of his discomfort is to be found in any of the journals kept by him." He was guided, as he expressed it, by a determination "that no consideration should make us flinch where the astronomical interests of the expedition were at stake." In addition to the work of the expedition, he took magnetic observations at the Cape of Good Hope, Kerguelen, Bombay, Aden, Port Said, Malta, Palermo, Rome, Naples, Florence, and Moncalieri, and lectured on the transit of Venus at the Cape and Bombay, and, on his return, at the Royal Institution. He also

communicated a paper on the subject to the British Association of 1875, illustrating his remarks by diagrams of the sun and the planet as seen from various stations, and was attentively listened to. The Americans had anticipated his party and taken the position they had intended to occupy, but they found a better one; and the three British detachments and the Americans co-operated, making four stations on the island. The weather was finer than they had anticipated from the accounts of the climate of Kerguelen, and from his station they were able to get observations of the internal and external contacts at egress. He was also a member of the observing party of the transit of Venus of 1882, in Madagascar, which was selected as one of the ingress stations. In 1886 he observed the eclipse of August 29th, at Carriacou, a small island to the north of Grenada; and in 1887 the eclipse of August 19th, in Russia.

In November, 1889, he sailed for the Isles de Salût to witness the solar eclipse of December 22d, and died soon after the observation. According to the account given of these, his last days, by Father Strickland, S. J., in The Tablet, he suffered much during the voyage from seasickness, and was in rather an exhausted condition when he reached the island. He nevertheless, intent upon his work, went ashore at once to inspect the proposed point of observation and introduce himself to the authorities. He was advised and urged to continue to live on the vessel (the Comus), going ashore only in the day. Father Strickland expressed the belief that if he had done this "his life would not have been sacrificed to the one anxious desire to do everything for the best for the success of the work confided to him." He preferred, however, to abide in the hospital, and said nothing of the illness which he felt. The road from the hospital to the observatory was steep and difficult, but he traversed it on foot four times a day. He complained the Friday before the eclipse of sickness, but worked till nearly three o'clock in the morning; lay down in a hammock in the tent to get a little rest where he was; was up again before six o'clock to take the position of the sun at rising; and superintended at half past seven a careful and successful rehearsal of the operations and duties that were to be performed in the observation of the eclipse the next morning. "Every one was surprised at Father Perry's exactitude in contributing to carry out his own orders, and his courage in facing fatigue. His readiness to sacrifice himself and his own convenience in order to save trouble to others endeared him to all who worked with him, and challenged their utmost efforts to secure success for their work in spite of the oppressive climate and surroundings." About noon on Saturday he was found much exhausted by a ship's officer who visited him, but was again at his post in the

observatory at three o'clock, where an important photograph was secured. In the evening he went to the ship for dinner, but was only able to lie on one side, and took some chlorodyne. He then persisted in going ashore and to his own quarters to sleep, in a violent rain. He passed a bad night, and was very ill on the following morning, the time of the eclipse, and permitted himself to be assisted over the half mile to the observatory, but would not be carried in a stretcher. Though very much exhausted when he reached the observatory, "as the important moment approached he seemed to rally, and during the minutes of the eclipse seemed to be himself again, and showed no signs of illness or exhaustion. There were two photographic instruments in use —one, an old one, which had often been in use before; the other was the special corona graphic instrument prepared for the occasion, of which Father Perry himself took charge. He was so alert and self-possessed during the eclipse that his friends about him hoped he was not so ill, but he gave way immediately after, and with much difficulty reached his quarters in the hospital." On Sunday night the critical nature of his disease, dysentery, became evident. On Wednesday he was better, and the ship set sail for Demerara. Friday afternoon his mind began to wander, and in an hour and twenty minutes afterward he died. Before he quite lost consciousness "he thought himself again engaged in 'the supreme moment of the scientific mission which had so long filled his thoughts,' and 'began to give his orders as during the short moments of the eclipse.'"

Steps were taken a few months after Father Perry's death to establish a memorial of him, to consist of a new fifteen-inch telescope, which, with the house in which it stood, should be called the Father Perry Memorial, the works done with which should be published under his name.

A THEORY of "partial impact" is suggested by Prof. A. W. Bickerton, of the New Zealand University, to explain the sudden appearance and rapid disappearance of "new stars." Recognizing the fact that enormous masses of incandescent matter can not cool in a few weeks, the author observes, as quoted in Nature: "A typical new star is probably a thousand times as bright as our sun; it appears suddenly and disappears in a year. . . . The formation of such a body is difficult to explain on any theory except that of impact, but to explain its disappearance is more difficult still. It is estimated that it will take the sun ten million years to lose half of its luster. Think of a sun a thousand times as bright cooling in a year! The idea is absurd." But if we accept Mr. Lockyer's theory that some stars are not coherent bodies like our sun, but masses of meteorites which in the case of new stars and variables collide with one another, the difficulty is much less. We have no longer an enormous mass all aglow, but numerous scattered masses, vastly smaller, and capable of rapid cooling.

Editor's Table.

SAFEGUARDS OF NATIONAL PROSPERITY.

THERE are two very sharply contrasted views of the conditions on which national prosperity depends, and we do not know how they can be better described than by naming them the scientific and the unscientific view, respectively. The scientific view of this and of every subject takes its start from Nature and the operation of natural law. The unscientific view takes its start from the idea of human intervention. The one finds the basis of all prosperity in the fruitful application of labor; the other thinks that nothing can be done well without incessant watchfulness to control and frequently to counteract the operation of natural forces and processes. According to the latter view, men and nations have to be guided, protected, and nursed into prosperity; according to the former, man is an animal who *wants* to be prosperous, and who has wit enough to attain his desires if he is only sufficiently let alone. So far as this country is concerned, no one can deny that what we have called the scientific view is sustained by facts, at least to this extent that, undeniably, the years when the most rapid advances were made in wealth and general prosperity were precisely those in which industry was least protected, and the principles of paternalism in government least developed.

An important characteristic of the scientific view is that it makes for national unity and for good will among men; while a most unfortunate characteristic of the other is that it tends to separate class from class and man from man in the most invidious manner. There is no one scheme by which the whole of a nation can be "protected." Protection is necessarily a piecemeal business, and what is accorded to one class becomes a pretext for similar or equivalent privileges to another class. In this way each class is led to watch with jealousy what is done for every other, in order to see that it is not left out in the distribution of state favors. The land is thus filled with countless law-made causes of rivalry and contention, and the minds of men grow small through the study of narrow and selfish interests, instead of being enlarged by the thought of one great onward movement in which, under the *régime* of liberty, all would participate.

Every protectionist system is dominated by the sentiments of fear and enmity—fear of and enmity toward those against whom protection is sought. That such sentiments are at war with and tend to depress and weaken the more generous instincts of a community who can doubt? When party orators talk of the "pauper labor" of the Old World, is it with any accent of sympathy for the hard lot of the alleged pauper laborers? Is it not always with a fierce accent of contempt for the laborers and hatred toward the countries to which they belong? We can truly say that we have no recollection of ever having seen or heard the term employed except with a distinct implication of contempt and hostility. Why is our country even to-day, when arbitration treaties are under discussion, so prone to anger and bitterness toward foreign countries, but particularly toward Great Britain, if not that protective policies steadily

and powerfully keep alive such sentiments in the hearts of the people? We are not at this moment discussing this question from an economic point of view. It would be quite possible to grant, from the latter standpoint, that what is called commercial protection is a national necessity; and yet to admit and lament the fact that the moral result of such a policy was most unfavorable to the national character, and, above all, unfavorable to those broad, liberal, and humane sentiments which ought to characterize a nation which habitually regards itself as leading the van of civilization.

An illustration of the pettiness to which what we have called the unscientific view of the means by which national prosperity is promoted naturally leads is found in the recent legislation which imposes an educational test upon foreigners wishing to make this country their home. The immigrant, if over sixteen years of age, must be able to read and afterward write from twenty to twenty-five words of the Constitution of the United States; otherwise he is sent back to the country whence he came. The individual may be physically sound, and may be a capable and patient worker, prepared, even with the drawback of illiteracy, to take his chances in this new land; but he is refused admission. Why? The main reason, as we believe, is that the throwing of such difficulties in the way of the foreigner is in line with the sentiments which, as a people, we have been carefully nourishing for a long time past. It is a phase of "protection." But surely do we need to be protected from foreigners who come here to do the hard work of the country? Is it not in our power to teach them respect for the law, if they need such teaching? And might it not be expected that the "free air" of this continent and the free play of American institutions would do something for their intellectual and political development? In times past, when our own illiteracy showed a larger percentage than it does to-day, and our whole population was much smaller, we admitted illiterate immigrants by the thousand without question and gave them a hearty welcome. To-day, when the volume of immigration is much less than it used to be, and when our own educational level is alleged to have materially risen, we must turn back the able-bodied foreigner unless he can show that he has been to school. In those days we made no question about our ability to absorb the vast hordes that presented themselves, and we did it. To-day, when our population is much larger and the number of strangers arriving much smaller, we impose a scholastic test.

Looking at the law as a proposed safeguard of national prosperity, we must say it has a most fatuous appearance. The ability to read and write shows that the individual has so far been cared for by others, but affords little evidence as to his own intelligence or character. A great many vicious and socially dangerous persons are to be found among the educated, so called, while among the wholly uneducated are large numbers of faithful and honest workers. It would be interesting, but perhaps a little disquieting, to know just how many persons in this country who could write out, if necessary, the whole Constitution of the United States are supporting themselves by more or less predatory modes of life; and it would be further interesting to know what proportion of their dupes they find among those who can read and write, and what among the wholly uneducated. The fact is that "education" throws open to the vicious means of fraud they would not otherwise have possessed, and

brings another class within the reach of dangers from which they would otherwise have stood entirely aloof. The man who can neither read nor write generally has a feeling of his own weakness, and is thrown back on his natural shrewdness and knowledge of things for self-protection, while a little school education, though of the shallowest kind, often puffs up its possessor to an amazing sense of self-sufficiency.

No one, we trust, will misunderstand the drift or purpose of these remarks. We wish in the first place to express our disapproval of the illiberal policy which would shut the door of this vast country, with its immense resources, in the face of a healthy, able-bodied immigrant, simply because he has not learned to read and write; and in the second place, to emphasize the position we have so often taken, that the mere ability to read and write is no safeguard whatever of character, no guarantee of the course in life which the individual will afterward pursue. There is in it the potentiality of further growth in knowledge, but there is also the potentiality of a life of scheming, of a life of sensuality, of a life of lawlessness. For one who can read there are useful books and papers to be had with very little trouble; but there are pernicious ones to be had with even less. The problem today is far less what to do with our illiterates than what to do with a considerable body of our literates, applying that term to all who can read and write; and to pretend that the welfare of the state is threatened if an almost imperceptible percentage of illiterate foreigners is added yearly to our seventy millions of population is hardly less than hypocritical.

The true safeguards of national prosperity have little to do with legislation of this character. They lie in respect for law, in a sense of justice between man and man, in a sense of responsibility on the part of those who through wealth possess power and social influence. They lie also in the faithfulness of public officers in the discharge of their duties, and in the recognition by every citizen of the truth that his actions count in the general sum of influences by which the fortunes of the state are molded for good or for evil. They lie, we need hardly say, in the right discharge by parents of their duties toward their children, and in the general soundness and purity of family life. They lie, finally, in a liberal, humane, and righteous public opinion, by which public policy is guided into right channels, and the evils which spring from diseased parts of the body politic are kept in check. These are the things we need to be concerned about, and which we must be concerned about if the nation is to prosper. Then, sooner or later, we must come to that *régime* of liberty which gives free scope to the activities and better sentiments of all. We must come to a belief that a vast amount of our intermeddling with the laws of supply and demand and the natural tendencies of things has been vain and hurtful. Until we reach this point our national prosperity will be on a more or less precarious basis, and our national character will not attain its best development.

A NATIONAL DEPARTMENT OF SCIENCE.

THE proposal has been seriously made in the columns of our contemporary Science that all the different scientific bureaus under the Government at Washington should be gathered into one great department of science under a ministerial head. The proposition is professedly

made in the interest of economy and efficiency. It is alleged that several of the bureaus now duplicate one another's work, partly through sheer want of system and partly through not knowing what one another are doing. The writer, Dr. Charles W. Dabney, Jr., thinks it is amazing that the Government has accomplished so much excellent scientific work through the agency of so unscientific an organization. The remedy he prescribes is "a general coordination of the scientific work of the Government"; but just what would be the effect of such a co-ordination he does not describe further than to hint that it would save money.

On the other hand, a writer in the same journal, who signs "Washingtonian," does not believe in Dr. Dabney's scheme at all. He inclines to the opinion that "consolidation would diminish results, impair efficiency, and do away to some degree with individual responsibility." He thinks that, as things are at present, practical objects are better kept in view and more effectually pursued than they would be under a department that had the whole field of scientific investigation for its province. "The chemical laboratories," says Washingtonian, "being consolidated, the chief chemist would be a greater man than any of his colleagues. No director of a bureau could control his own chemical work. With demands for particular jobs from several bureaus on hand it would be wholly uncertain when any of them would be finished. Complaints would be met by playing off one against another. Responsibility, and to a large extent efficiency, would be lost."

In this dispute we are disposed to hold with Washingtonian. A general department of science would in our opinion be altogether too vague in its objects, and too little governed by a sense of the practical, to render satisfactory service to the public. It would be almost impossible to prevent it from wandering off into purely theoretical work and into all the fads of specialist research, and in a very few years taking up a position and assuming a character never contemplated when it was established. We hold, moreover, that it would be quite worth while to move the previous question: whether, already, the Government does not engage in various lines of scientific activity which might perfectly well be left to private effort. Government work has this peculiarity, that it is never done; just as "infant industries" have the peculiarity, of never outgrowing the tariff bottle. If a geological survey is undertaken, it must go on *ad infinitum*. If a private company had a piece of land which they wanted surveyed geologically or otherwise, and employed certain persons judged to be competent to take the work in hand, they would expect them to finish it, and that within a reasonable time. They would not expect them to camp everlastingly on the ground, and never hint at any finality to their alleged labors. With Government work it is different; it goes on for its own sake, or for the sake of the salaries connected with it; and the rustic voter who expects to see it some day completed will have an experience like that of the more ancient rustic, who stood by the river side expecting to see the stream run itself dry.

What we want, of course, far more than a national department of science, is an intelligent and honest Congress, out of which can be formed intelligent and honest committees capable of criticising the work of government, and intent on reducing it within the limits indicated by considerations of public utility. It

rests with the people to say when we shall have such a Congress. It is all a question, as we lately pointed out, of disinterestedness in the exercise of the franchise. Whenever the time comes that the people as a whole, or a preponderant majority of the people, desire good and honest government, and are willing to take a little trouble to secure it, many things will be possible of which at present we can only dream.

MR. WELLS ON METHODS OF FEDERAL TAXATION.

It is one of the most serious evils of the methods of political discussion current among us that petty, local, and temporary considerations are given predominance, and graver, broader views, looking to the general public welfare and to ultimate results, are very little regarded.

We have a government, according to the well-worn phrase, of the people, for the people, by the people; but what "the people" do not always see is, that the government which they actually call into being is not a government of the people *as a whole*, for the people *as a whole*, and by the people *as a whole*, but a government in which rival interests, class and sectional, more or less check, thwart, haggle with, and corrupt one another, and in which the real interests of the community as a whole are too often lost sight of. The standing difficulty under our system is how to get important interests duly attended to, how to get great questions adequately discussed. Matters of minor importance, particularly such as may become the subject of a "deal," can always secure attention; but, when the wider and more lasting interests of the nation are concerned, our legislative bodies show only too plainly that these are not the matters they care to deal with. The truth is they are not, speaking broadly, the matters they were elected to deal with, each constituent body having regard mainly, in choosing its representative, to local and special interests, not to those of the country as a whole.

The article which we publish in this number from our valued contributor, the Hon. David A. Wells, entitled How can the Federal Government best raise its Revenues? furnishes an admirable example of the manner in which great questions of public policy should be approached and treated.

Mr. Wells indicates what might be done if our statesmen would only deal with the question of taxation disinterestedly, casting aside the mischievous prejudice engendered by partisan rivalries and squabbles, and solely with a view to the public good. He points out that some of his suggestions would involve going counter to certain popular prejudices, but he makes it clear that these prejudices have nothing to do with the public good except to thwart and obstruct it. His appeal is to the reason and patriotism of Congress and of the country at large, and it will so far help, we have no doubt, to raise the tone of political discussion. To this end we cite his article as an example of earnest and thoughtful argument —the kind of argument that is too seldom addressed to popular audiences and too seldom heard in our legislative bodies.

The question of protection and free trade is very slightly if at all touched upon in Mr. Wells's article. But we can not refrain from saying that, in our opinion, this great nation can never be right with itself or with the world so long as the protection sentiment rules the thought of the people. To say that the way to make ourselves prosperous is to shut out the products of the rest of the world, even

when offered to us at the most advantageous prices, is on the face of it an absurdity. The fundamental idea of trade, whether domestic or foreign, is that you get an article that is of more value to you than the thing you part with; and how a nation can benefit itself by greatly restricting the number of its profitable exchanges is something that no unsophisticated mind can understand. Add to this the bitterness of feeling toward foreign nations and the consequent littleness of mind which the protective system breeds; add to it also the political demoralization which tariff arrangements always involve, the corrupt relations they tend to create between the party in power and the privileged interests, and the conclusion will be inevitable that the system in question can not be a permanent policy for a self-respecting nation.

There are other questions pressing forward in our national affairs which need to be treated with sole regard to the welfare of the nation as a whole, and with views looking to the future rather than being confined to selfish interests and the emergencies of the present. Whatever may be said of the validity of Mr. Wells's arguments, his breadth of view and his method of presenting them may well be commended to all whose work it may be to deal with these subjects.

Scientific Literature.

SPECIAL BOOKS.

THE object of the *Ancient Ideals* of Mr. *Henry Osborn Taylor** is to present a new historical survey of the mental and spiritual growth of mankind in the light of the recent progress of historical research and the modifications of opinion that have been occasioned thereby. The attempt is made to treat human development from the point of view of the ideals of the different races as these ideals disclose themselves in the art and literature, in the philosophy and religion, and in the conduct and political fortunes of each race. The author has endeavored to preserve a unity of plan in setting forth the part taken by each race in the history, to make clear the nature of the contribution made by each to the stages of growth attained before the Christian era, and to indicate in what respects their contributions became permanent elements of humanity and thus elements of its further possibilities—possibilities which he believes find in Christianity the perfect conditions for their final realization. The life of the peoples, if we comprehend the author's thought correctly, is a striving after ideals, which are never quite reached directly by the strivers; and "the complete story of human progress is the story of ideal conception and of endeavor, and the unfailing realization of ideals in the growth of human beings with ideals uplifted and enlarged." This makes the narrative of the enlargement and upraising of human life; it is a history of the growth of human personality; of the age-long development of the characters of men and women. Accordingly, we have in this book the story of the life and

* Ancient Ideals: A Study of Intellectual and Spiritual Growth from Early Times to the Establishment of Christianity. By Henry Osborn Taylor. New York: G. P. Putnam's Sons. In two volumes, 8vo. Price, $5.50.

works of each of the greater ancient nations looking toward something it could not quite attain ; taken up and carried on by some other people, which still fell short of the yet higher aim set before it, and so on. "Egyptian thought was characterized by crass confusion," analyzed nothing, had no clearness or consistency or power to discriminate and classify. Its ethics consequently remained unsystematized precept, and, "with all the picturesque elaborateness of a future life, no thought of spiritual immortality was reached." All its art and literature and religion, as we have them, point to this conclusion. In Babylonia the earliest Sumerian and Accadian peoples were subdued by the stronger but less cultivated Semites, who acquired their civilization and built upon it one distinguished by the strength and practical intelligence of its toil, which was sustained for twenty centuries. Then came the Assyrians, whose ideal was power and who created nothing. The Chinese had a mighty power of industry, with docility to national government, and the faculty of ethical formulation which produced their classics and their distinctive modes of thought. The Aryans of India possessed qualities of mind and spirit out of the reach of all these peoples, with a turn to philosophic thought, and were able to produce the Vedas, the Brahmanic philosophy, and its reaction, Buddhism. Those of Iran developed the ideas of a dual warfare between good and evil, with the final triumph of the good and of life over death, with the "grand and spiritual" conception of the supreme Lord of Good revealing himself to his prophet. The Greeks sought logical consistency, the highest beauty in things physical and mental, to make the most of life in its manifold aspects, and to get the most out of it. The Romans consolidated and exalted the family and the state, built up institutions, systematized the law, and constructed enduring public works, but originated little. The Hebrews held the conception of God, "one living personal, righteous, immediate in his governance of the world he made ; and the supplementing thought of man created in his image, bound to obey his will and imitate his ways. The development and the greatening of the Hebrew personality was to lie in the enlargement of the thought of God, and in the endeavor to conform human conduct to his will and ways ever more largely known." Finally came Christianity, including and setting forth the highest and farthest possibilities of life ; affording scope for the inclusion of all qualities and capacities of mankind, and for the development of the whole man in the service of God ; predicating veritable relations between God and man ; and touching and ordering all things in man's daily life.

All the world admires an adventurous spirit, and no one to-day holds a higher place in the world's esteem on this account than Fridtiof Nansen. The personality of this young man of thirty-five, who has already accomplished the only crossing of Greenland by a European and has at one leap advanced the farthest north point of arctic explorers by nearly three degrees, could not fail to be of deep interest, and the interest increases the more one knows of him. A fittingly picturesque account of his life and labors has been brought out in a handsome volume by the Messrs. Longmans.* His biographers show us clearly that Nansen has always had

* Fridtiof Nansen, 1861–1893. By W. C. Brögger and Nordahl Rolfsen. Translated by William Archer. London, New York, and Bombay : Longmans, Green & Co. Pp. 402, 8vo. Price, $4.

most strongly developed the Norseman's wild delight in conquering difficulties. As a boy he struggled with cold and ice and with other boys hardy like himself. He spent his money for tools and chemicals when he was expected to yield to the seductions of toys and gingerbread. A hard problem was his delight, whether it was mathematics, the mechanism of a sewing machine, or how to make the longest leap on snowshoes and he never rested till he got to the bottom of it. Then he threw all thought of it to the winds and attacked another. After he had developed a decided taste for science and chosen zoölogy for his specialty, almost his first training in descriptive research was gained in a sealing voyage undertaken by the advice of Prof. Collet. In the seal hunting and bear hunting on the ice he acquired training for his famous feats of exploration and his first decided bent in that direction. After his return he studied first at the Bergen Museum and then at the Zoölogical Station at Naples. There are several contributions in the volume by other hands than those of the principal authors. One of these, by Gustav Retzius, tells what Nansen has done as a biologist, showing that he has performed good service in several directions. The account of the Greenland expedition is prefaced by two chapters giving a general description of the country and of the great ice age which, one may say, still persists there. The authors tell us how he made known his plan to Nordenskiold, Rink, and others, how earnestly he answered all objections, and, after making careful preparations, set out on his dangerous undertaking and brought it to a successful issue. Nansen's home must be an eagle's nest, and his wife a fitting mate to the intrepid explorer, if we are to trust the glimpse of her given by one of the authors, Nordahl Rolfsen. He describes humorously a visit to Mrs. Nansen for the purpose of interviewing her about her husband at the time the rumor was current that Nansen had reached the pole. The interviewer found her gay and severe by turns, but uncommunicative through it all. "Like a figure from the Sagas," he describes her, proud, high-strung, and as strong in her way as her husband. A special historical value is given to the book by the sketch of arctic expeditions from the earliest times, contributed by Aksel Arstal, and the chapter by Prof. H. Mohn summarizing the contributions of Norwegian seamen to arctic geography. A geological description of the New Siberia Islands is contributed by the Baron Edward von Toll. The remaining chapters are devoted to Nansen's plan of his polar expedition, his preparations, and his start. With the main features of these matters the world is now well acquainted, but the details have an absorbing interest, especially when told with the vim and color of our northern authors. The volume is illustrated with many portraits of Nansen, his family and companions, and many views of scenes connected with his doings. There are also three folded maps of northern regions.

The questions which have been raised by the experimental investigation of automatic movements, recently carried on in France and England, are among the most interesting with which contemporary science has to deal. In this sphere, as in so many others, the naïve belief in the essential simplicity and reasonableness of Nature, which in the scientist is the counterpart of the child's faith in the native goodness of grown folk, has suffered a shock. Although at present we can scarcely do more than say that

the relation of the human consciousness to the apparently intelligent, purposive movements which the body executes is by no means as simple as we thought, any attempt to discuss the problem from the empirical point of view will be welcomed. With the exception of Mr. F. W. H. Myers's papers and reviews, in the publications of the Society for Psychical Research, and of the series by Prof. W. R. Newbold, which recently appeared in this magazine, no discussion of the matter at all commensurate with its importance has appeared, and Mrs. Baldwin's translation of M. *Binet's* book* will therefore be doubly welcome.

M. Binet adopts the conception of double personality—that is, coexistent personalities—and makes use of it consistently for the explanation of all forms of motor automatism, from the most rudimentary twitchings of an anæsthetic hand to the fully developed automatic script which manifests memories, emotions, and desires unknown to the primary self. All alike, he holds, evince the existence of a "little consciousness by the side of a greater—a small luminous point by the side of a great focus of light." The precise character of the secondary consciousness he does not try to determine for all cases, recognizing that it probably varies indefinitely; and he agrees with Pierre Janet, as against Myers, in regarding it as essentially a pathological phenomenon. On the whole, he avoids the pitfall of regarding evidence for the existence of dissociated states as in the same sense and to the same degree evidence for the existence of a fully equipped secondary self, but in one curious passage (p. 210) he seems fairly to fall into it.

Especially interesting are Chapters VI to VIII, in which M. Binet tries to determine the relation of the subconscious field to the upper self. The evidence which he has collected—the greater part of it, indeed, being based upon tracings taken by himself of the movements of an anæsthetic hand under varying conditions—is of the highest importance, and bears directly upon the relation of the margin to the focus in the normal consciousness. Chapter VIII, on Ideas of Subconscious Origin, gives a brief account of the brilliant series of experiments by which M. Binet proved that in some patients touch stimuli which were not felt by the patient gave rise nevertheless to visual hallucinations representing to some degree the object touched, and in one case at least (page 213) extraordinary subconscious hyperæsthesia seems demonstrated.

M. Binet does not treat of the cognate questions involved in the phenomena of normal suggestibility, trance, ecstasy, and hallucination, nor does he endeavor to develop psychological principles of universal application. In conclusion, he points out how unsatisfactory the common notions of association, of unconscious cerebration, and of personality become when viewed in the light of these facts, but, with that exception, he does not show the bearing of the latter upon the more profound problems of mind and brain. Perhaps he feels that the time has not yet come for that; but he marshals the facts with discretion, and if his conceptions are not always as clear as they might be, there are few of us who would wish to cast the first stone at him.

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* Alterations of Personality. By Alfred Binet. Translated by Helen Green Baldwin, with Notes and an Introduction by J. Mark Baldwin. New York: D. Appleton & Co. Pp. 356, 12mo. Price, $1.50.

GENERAL NOTICES.

Mr. *R. P. Halleck's* recent book was not written for scientists, and scientists as such will find nothing in it.* The author undertakes merely to make a practical application of the results which others have attained by patient investigation. His book is written for teachers and parents, and every teacher or parent who reads it from an educational standpoint will be amply repaid. The author aims to emphasize the facts that a large element in education consists in the physical modification of brain and nerve cells; that these cells are more easily modified at one age than at another; that the effects of wrong training or lack of training can never be eliminated in later life; that every person, in order to live a full life, must have all his senses and the corresponding brain-cells developed in his youth. The first chapters give a summary of our present knowledge of the nervous system and the changes that have been found to occur as results of growth, fatigue, and training. Then follow discussions of the effect of environment on training, and on development as related to age. Various definite suggestions are given for training the different senses in the classroom, both by immediate objects and by the formation of memory images. The chapter, How Shakespeare's Senses were Trained, is interesting and intensely practical. The great value of motor training is clearly demonstrated; and the final plea for the early symmetrical development of all the senses as a preparation for fuller, more joyous life in later years is another expression of the present hope for a brighter future in education. Our scientific knowledge of the facts in the case, the changes in brain-cells which are correlated with education, how these vary under different conditions, and how far they may be varied by training, is meager enough as yet; and many scientists would have hesitated to construct such a book on the basis of our present knowledge, while recognizing the far-reaching importance of the investigations which are now going on. Owing to the widespread interest in these questions, we expect in the near future numerous contributions to pedagogy from experimental and physiological psychology. Scores of books similar in scope will doubtless be written, more complete and more valuable to the teacher. Meanwhile we already know far more than we practice, and thousands of children will be indebted to this book for a broader, deeper, and more sensible education.

A text-book of physiology for medical schools has been prepared by ten collaborators under the editorship of *W. H. Howell*, Professor of Physiology in the Johns Hopkins University.* The physiology of the muscles is treated by Prof. Warren P. Lombard; secretion, digestion, the blood, and some allied topics, by Prof. Howell; the circulation, by Profs. John G. Curtis and W. T. Porter; respiration and animal heat, by Prof. Edward T. Reichert; the central nervous system, by Prof. Henry H. Donaldson; vision, by Prof. Henry P. Bowditch; the other special senses and the voice, by Prof. Henry Sewall; reproduction, by Prof. Frederic S. Lee; and the chemistry of the animal body, by Prof. Graham Lusk. The preparation of such a work by collaboration is unusual, and the editor names as advantages of this method that it enables each author to base his account upon a comprehensive knowledge of the part of the subject assigned to him, and that the student gains by it the points of view of a number of teachers, especially where the various topics overlap. References to literature are given, and some of the authors have used them so freely as to afford fairly complete bibliographies of their respective subjects.

The purpose of Mr. *Woglom's Parakites*† is to place before the public the result of the

* The Education of the Central Nervous System. By Reuben Post Halleck. New York: The Macmillan Co. Pp. 258, 12mo. Price, $1.

* An American Text-Book of Physiology. Edited by William H. Howell, Ph. D., M. D. Fully illustrated. Philadelphia: W. B. Saunders. Pp. 1052, royal 8vo. Subscription price, cloth, $6; sheep or half morocco, $7.

† Parakites. By George Totten Woglom. New York: G. P. Putnam's Sons. Pp. 91, 4to. Illustrated. Price, $1.75.

investigations and of the practical experience of the writer in the construction of tailless kites—parakites is the awkward, half-Greek, half-English name he gives them—and in the perfection of methods for flying them in various conditions of the atmosphere. Mr. Woglom is a business man well occupied, and has given attention to the making and flying of kites only as an avocation and recreation, without laying any claim to be a student in the scientific bearings of the subject, or in aërodynamics. Nevertheless, he never forgets the possibilities of a scientific outcome from experiments with kites, and keeps them well in the mind of his reader. His treatise opens with a view of Oriental kite-flying, its history, so far as it is recorded, from its use in Malaysia a thousand years before the Christian era, and the possible religious significance of its origin—to carry prayers to the divinities above. Descriptions of Japanese, Chinese, Javanese, and other Oriental patterns follow; then the author's experiments in kite making and flying, in photographing from kites, etc., are given, and the principles of the construction and management of kites as embodied in Oriental forms and discovered in the author's own experience are recorded, and the possible scientific applications are glanced at. The whole forms an interesting and instructive treatise.

The main object of Mr. Holden's paper on mountain observatories* is to study the conditions suitable for astronomical work at high levels, while meteorological and physiological conditions enter into consideration in a subordinate degree. The author's studies bearing on the subject began during the summer of 1873 in the mountains of central Colorado. His observations were repeated at intervals till he was called to Mount Hamilton in 1888, where he has had opportunities to compare the conditions with those at nearly every observatory in the United States and with stations in other countries. His purpose in this paper is to collect and study the many scattered notices of the conditions of good vision at mountain stations all over the globe. We have thus notices or descriptions of the experiment at Teneriffe, and of the observatories at Nice, Mont Blanc, Ben Nevis, the Santis, the Sonnblick, Arequipa, El Misti, and many others abroad, and of the mountain observatories in the United States —illustrated by many photographic reproductions—concluding with a few remarks on scientific ballooning and kite-flying, from which Mr. Holden expects even greater results, at least in meteorology, than from mountain-top observation. A copious bibliography of the subject is given.

Plants and their Children, by Mrs. *William Starr Dana* (American Book Company, 65 cents), is a child's reading book, designed, while it entertains and instructs, to create an interest in children in botany. It consists of a series of easy lessons or readings on the wonders of plant life written in such a manner as to make them entertaining as stories. The various forms and curious features of familiar plants and trees, including their roots and stems, buds and leaves, fruits, seeds, and flowers, are thus described. The book is so arranged as to correspond both with the course of the school year and the seasons of development of plant growth.

The Division of Forestry of the United States Department of Agriculture has done a creditable service in issuing its bulletin on *The Timber Pines of the Southern United States*. This publication consists of separate chapters by Dr. *Charles Mohr*, on the species known as the long-leaf, Cuban, short-leaf, loblolly, and spruce pines, together with a brief description of the wood of these five pines, by Filibert Roth. The distribution and botanical characters of each species are given, the products obtained from it, conditions necessary to its growth, its enemies, and the forest management required by it. The information under each of these heads is full and practical. In an introduction, B. E. Fernow, chief of the Division of Forestry, calls attention ro the facts that the Southern States abound in those sandy soils which afford sufficient sustenance for the pines but are practically useless for anything else, and that the forest wealth of this section is being seriously impaired by wasteful methods of cutting timber, by the repeated conflagrations that follow the lumbering, and by the operations of the turpentine gatherers. Contrary to a common belief,

* Mountain Observatories in America and Europe. By Edward S. Holden. Washington: Smithsonian Institution. Pp. 77, 8vo, with Plates.

however, the tests made by the Division show that timber that has been bled for its resin is as strong as unbled, if of the same weight. Some attempt has been made to perform the difficult task of estimating the remaining resources of the Southern pine forests, and no pains have been spared to impress upon the owners of timber lands and the operators of mills a knowledge of the treatment required to preserve the value of their investments. The volume is illustrated with many plates and cuts.

Fifty of the biographical sketches that have appeared in this magazine have been revised by the editor and issued in a volume under the title *Pioneers of Science in America* Appletons, $4). As the title denotes, the book includes only Americans, and is devoted to the earliest of these who were prominent in the field of science. In revising and completing each of the sketches Dr. *Youmans* has had the aid of some descendant or pupil of the subject in all cases but a few of the earliest. Some of the accounts have been much extended for the book. That of Benjamin Franklin, which opens the volume, is entirely new, and is the first systematic account of what Franklin did in science. That of S. F. B. Morse also has not appeared in the Monthly. Among those that have been largely rewritten are the sketches of Silliman, Torrey, Henry, Coffin, and Agassiz. New portraits have been substituted for a few made in the early days of the magazine that were not uniform in style with the rest. Steel portraits accompany the articles on Franklin and Morse, and there is a heliotype of W. B. Rogers. The latest subject included in the volume is David Dale Owen, who was born in 1807.

A handy little book embodying *The Elements of Commercial Law* has been prepared by *Albert S. Bolles*, lecturer on law in the University of Pennsylvania (Holt, $1). Under twenty heads, such as Parties, Assent, Seller and Buyer, Partnership, Negotiable Paper, Insurance, Shipping, Deeds and Leases, and Corporations, it gives systematically and briefly the substance of what the business man needs to know in order to secure contracts that can be enforced, if necessary, in the courts, and to avoid improperly jeopardizing his own interests. The volume is indexed, and the topics treated in the several numbered paragraphs of each chapter are given at the head of the chapter.

A first memoir on *The Bombycine Moths of America North of Mexico*, by Prof. *Alpheus S. Packard*, has been issued by the National Academy of Sciences. It is devoted to the *Notodontidæ*, and includes descriptions of the insects in their larval, pupal, and adult forms, with notes on their habits, food plants, geographical distribution, etc. This is the first installment of what Prof. Packard intends to be a general account, systematic and developmental, of our North American bombycine moths. He has aimed to describe these moths in the light of Weismann's suggestive and stimulating Studies in the Theories of Descent (1882), being convinced that additional knowledge of their ontogeny will lead to a comprehension of the phylogeny of the higher *Lepidoptera* in general. From the facts connected with the transformations of the bombyces, also, he believes much may be learned with reference to the transmission of acquired characters. The monograph is accompanied by forty-nine plates, many of them colored, and ten maps showing the distribution of genera. There are also about ninety figures in the text.

Part IV, Vol. X, Second Series, of the *Journal of the Academy of Natural Sciences* is devoted to papers on the crania, implements, and other objects found by Mr. Clarence B. Moore in certain mounds in Florida. In the first paper, Harrison Allen, M. D., describes five crania from mounds on the St. Johns River, comparing them with crania from other parts of North America. In three papers which follow this Mr. Moore describes a large number of implements of stone, earthenware, and bone, and some of shell and copper. The papers are accompanied by thirty-eight plates and many figures showing the crania and other objects of full size.

The first part of a comprehensive work by *David Starr Jordan* and *Barton Warren Evermann* on *The Fishes of North and Middle America* has been issued as Bulletin No. 47 of the United States National Museum. It is a descriptive catalogue of the species of fishlike vertebrates found in the waters of North America, being in a sense a revision

of Jordan and Gilbert's Synopsis of the Fishes of North America, but with the text entirely rewritten and covering a greater geographical range than the Synopsis. By the extension of range, which brings in the faunas of Mexico, Central America, and the West Indies, the number of species included has been more than doubled. The fact to which the authors call attention, that over a hundred species have been added to the list within the time taken for printing the present volume, shows that there is still work to be done in the same field. The classification and sequence of groups adopted for this catalogue is essentially that of Dr. Theodore Gill, freely modified to suit the present purposes of the authors. In the arrangement of the families and genera they have endeavored to avoid unnatural associations and incoherent groups, even at the risk of what may seem an excessive subdivision. Among the forms commonly called fishes the authors recognize three classes—*Leptocardii*, *Marsipobranchii*, and *Pisces*. The present part of the work extends to twelve hundred and forty octavo pages, and contains descriptions of sixteen hundred and twenty-seven species, of which four are *Leptocardii* and eleven are *Marsipobranchii*. An atlas is to accompany the work when completed.

Mr. *James Bryce* has prepared an abridged edition in one volume of his able and popular work on *The American Commonwealth* in order to make the book more available for the unexpected demand that has arisen for it as a text-book in American colleges and high schools (Macmillan, $1.75). The abridgment is divided into three parts, dealing respectively with the National Government, the State Governments, and Political Methods. In selecting the parts of the original work to be used in the single volume the author has been aided by Jesse Macy, Professor of Political Science in Iowa College. The Constitution of the United States is appended, and the volume contains lists of the Presidents, the States, and important events, together with a full and carefully made index.

The method of *Cairns's Manual of Quantitative Chemical Analysis*, which has now reached a third edition, is, by explaining some of the more serious obstacles to successful analysis, to teach thoughtfulness and caution, and, by giving very explicit directions in the earlier part of the course, to induce habits of precision and enable the student to proceed without further leading. The important changes that have been made in the practice of analytical chemistry since 1880, when the book was first published, has rendered a thorough revision necessary, and this has been given to it by Dr. *Elwyn Waller*. The editor has aimed to give descriptions and directions for such methods as are generally pursued in most analytical laboratories, with brief references to the theory of other methods, that the student may have presented to him one or two plans of procedure which find acceptance to-day, and at the same time suggestions of other plans which may lead to modifications of our present methods. Radical changes having been made in the science and practice of quantitative proximate analysis since the death of the author, all the chapters relating to that subject have been cut out, leaving only what was always the chief feature of his work, namely, mineral analysis. Both the author and the editor have been instructors in analysis at the Columbia School of Mines. (Holt, $2.)

An addition to the number of journals representing the science of chemistry in this country has been made by the establishment of *The Journal of Physical Chemistry* at Cornell University. It is to be issued monthly, except in July, August, and September, under the editorship of Profs. *Wilder D. Bancroft* and *Joseph E. Trevor*. The first number contains papers on Irreversible Cells, by A. E. Taylor; Chemistry and its Laws, by F. Wald; and a second paper on Ternary Mixtures, by Wilder D. Bancroft. There are also several book notices and a department of reviews, conducted by a board of six reviewers, in which are given critical digests of recently published papers bearing on physical chemistry. (The Editors, Ithaca, N. Y., $2.50 a year.)

The treatise on *The Magnetic Circuit in Theory and Practice*, by Dr. *H. du Bois*, which has been translated by Dr. Atkinson (Longmans, $4), is designed to be a systematic and critical account, from the physical

point of view, of the more important developments in its field. Electro technology, which in the last decade has exerted an important action on those branches of physics which form its base, "seems at present," says the author, "to have entered on a phase of quieter development; and from the scientific point of view the time appears suitable to survey the position, critically to investigate results of very unequal value, often hastily brought to light amid the bustle of practical work, and to blend the older as well as the more recent results into one consistent exposition." He has not included much historical matter except in the seventh chapter, where he gives the history of the analogy between the magnetic circuit and various other kinds of circuits. The first five chapters of the work are devoted to Theory, and the last six to Applications. In stating the theory of the magnetic circuit, a knowledge of the results of investigations into ferro-magnetic induction is assumed. In Chapters III and IV the outlines of the theory of "rigid" magnets on the one hand and of absolutely "soft" cores on the other are summarized, the mode of treatment being similar to that of Maxwell. The topics falling within the second part of the book—magnetic circuits of dynamos or electromotors and of various kinds of electromagnets and transformers, the experimental determination of field intensity, magnetization, induction, etc.—are treated more from the point of view of applied physics. Wherever the more important results of allied branches of mathematical or experimental physics are assumed to be known, the author has referred to the original passages in accessible text-books. There are also many references to original papers in which details may be further studied.

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with Special Reference to the Value of Heat. Pp. 16; Serum Therapy in Pulmonary Tuberculosis, etc. Pp. 7; Cocaine Poisoning, with Report of a case. Pp. 6.—Kunz, George F.: The Production of Precious Stones in 1895. Pp. 32.—Mearns, Edgar A.: Preliminary Diagnosis of Certain Mammals from the Mexican Border. Pp. 4.—Outerbridge, A. E., Jr.: The Future of American Industries. Pp. 12.—Peck, John Hudson: The Rensselaer Polytechnic Institute. Pp. 36.—Russell, Israel C.: The Influence of Débris on the Flow of Glaciers. Pp. 10.—Townsend, C. H.: Description of a Closing Tow-net for Submarine Use at all Depths. Pp 8, with plates.—Wilbur, Cressy L., M. D.: How the Establishment of a Permanent Census Bureau will improve the Vital Statistics of the United States. Pp. 8.

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Fragments of Science.

The Library of Prof. Du Bois-Reymond.—The library of the late Prof. Emil Du Bois-Reymond, a collection of extraordinarily high value, is for sale by Gustav Fock, Neumarkt 40 and Magazingasse 4, Leipzig, Saxony. It comprises more than fourteen thousand volumes and pamphlets, nearly all the books being bound, while the smaller writings are mostly arranged in collecting boxes, partly alphabetically and partly systematically. It contains sets, more or less complete, of about forty-five scientific journals and transactions of societies of all scientific countries and nearly every scientific work that has been written on physiology, physics, and philosophy. Almost every volume bears Prof. Du Bois-Reymond's own signature; and a very large number of the books, especially of his own works, are enriched by additions, memoranda, notices, appendices, and remarks in his own handwriting—of unique value. Prof. Du Bois-Reymond's heirs desire that the library be kept unseparated; and, to promote this object, will give preference to bidders who will guarantee preservation as a whole. In the case of duplicates reasonable arrangements will be made for the repurchase by Herr Fock of such volumes in that category as may not be wanted. The library, valued at 30,000 marks, or $7,500, is offered for 22,000 marks, or $5,500. Cable messages regarding the purchase may be sent to the cable address, "Buchfock," Leipzig; "Du Bois," if the proposition is to purchase the complete set on the terms offered; "Reymond," if a catalogue is wanted before giving a decision.

Tides of the Bay of Fundy.—The real character and height of the famous tides of the Bay of Fundy, as given by Prof. W. M. Davis in Science, from the Canadian Geological reports, are as follows: "From the mouth of the bay, forty-eight miles wide and from seventy to one hundred and ten fathoms deep, the bottom rises at the rate of four feet a mile over a distance of about one hundred and forty-five miles to the head. On the coasts adjacent to the mouth the spring tides vary from twelve to eighteen feet. Within the bay the spring and neap tides are as follows: Digby Neck, 22·18; St. John, 27·23; Petitcodac River, 46·36; Cumberland Basin, 44·35; Noel River in Cobequid Bay, 53·31; the last named being the greatest tidal oscillation in any part of the bay. The flood tide rises about twenty feet above mean sea level; the ebb falls the same amount below, leaving the branch bays empty or nearly so. The tidal bore is seen in Maccan River, entering Cumberland Basin, but is stronger in Petitcodac River, entering Shepody Bay. At the

head of this river, by Monctin twenty miles from the bay head, the bore is seen to best advantage; it rushes in 'as a foaming breaker, five or six feet high, with a velocity of five or six miles an hour.' The spring and neap tides have forty-five and thirty-eight feet range. The ebb tide runs like a mill race; the water rapidly sinking, and the river is reduced to a small meandering stream. It so remains about two hours, when the rushing waters of the bore are heard again, and the river is soon filled with their sweeping flood."

Necessities of Geological Time.—One of the questions considered by Prof. E. B. Poulton, in his presidential address before the Geological Section of the British Association, related to the length of time required for the development of animal life on the earth to its present condition—"whether the present state of paleontological and zoölogical knowledge increases or diminishes the weight of the opinion of Darwin, Huxley, and Spencer, that the time during which the geologists concluded that the fossiliferous rocks had been formed was utterly insufficient for organic evolution." The arguments of the physicists, derived from the supposed effect of tidal action upon the length of the day, and from the estimated length of the time occupied by the earth in cooling from an assumed temperature to its present condition, are shown to have been proved invalid as bases for calculating the probable age of the earth as a life-bearing body. The argument derived from the supposed life of the sun has not yet been ruled out, and that gives a maximum of five hundred million years. The computation of the time required for depositing the geological strata gives a minimum of seventy-three million and a maximum of six hundred and eighty million years—possibly four hundred million years. The author's inquiry as to how much of the whole scheme of organic evolution has been worked out in the time during which the fossiliferous rocks were formed does not deal with the time required for the origin of life or for the development of the lowest beings with which we are acquainted from the first formed beings, of which we know nothing; but only with so much of the process of evolution as we can infer from the structure of living and fossil forms. The comparison is made from a study of the evolution of the phyla. All available evidence points to the extreme slowness of progressive evolutionary changes in the cœlenterate phyla, although the protozoa are even more conservative. When we consider further on the five cœlenterate phyla that occur fossil, we shall find that the progressive changes were slower, and indeed hardly appreciable in the echinoderms and gephyrea, as compared with the mollusca, appendiculata, and vertebrata. Within these latter phyla we have evidence for the evolution of higher groups, presenting a more or less marked advance in organization. As a whole, the comparison is quite enough to necessitate a very large increase in the time estimated by the geologist. We can hardly escape the conclusion that, for the development of the arthropod branches from a common chetopodlike ancestor and for the further development of the classes of each branch, a period many times the length of the fossiliferous series is required. The evolution of the ancestor of each of the higher animal phyla probably occupied as long a period as that required for the evolution which subsequently occurred within the phylum. But the consideration of the higher phyla which occur fossil, except the vertebrata, leads to the irresistible conclusion that the whole period in which the fossiliferous rocks were laid down must be multiplied several times for this later history alone. The period thus obtained requires to be again increased and perhaps doubled for the earlier history.

The New Zealand Alps.—The "Alps" of the Southern Island of New Zealand are described by Mr. Fitz-Gerald as being more like the Pyrenees than the Swiss Alps in structure, in that they are a single range rather than constituted of parallel folds. The highest peak, Aorangi, or Mount Cook, is 12,349 feet high, but not many of the others rise above 10,000 feet. The snow line is, however, 2,000 feet lower than in Switzerland, and the glaciers descend much nearer to the sea level, the great Tasman Glacier coming down to about 2,350 feet, several to 1,200 feet, and the Fox Glacier to 700 feet. Nearly twice as much snow falls upon some of their slopes as at corresponding positions on the

Alps. The peaks and glaciers are in many respects harder to climb than those of Switzerland. Besides serious deficiencies in roads and accommodations, and the absence of guides so complete that the explorer has to bring his own with him from Europe, they are actually more dangerous than peaks of corresponding elevation in Switzerland, the rock being very incoherent and slippery. Mr. Fitz-Gerald had many narrow escapes, the most serious accident being caused by the unexpected fall of a great block of stone. He ascended four peaks—Mount Tasman, 11,475 feet; Mount Sefton, 10,350 feet; Mount Haidinger, 10,054 feet; and Mount Sealy, 8,631 feet—and crossed three new glacier passes. One of these, to which the author's name has been given, is practicable and valuable, in that it makes possible direct communication between the eastern and western coasts, where none had been before except by sea.

Bees as Weapons of War.—History records two instances, according to Mr. Whiteley Stokes in the London Athenæum, in which bees have been used in warfare as weapons against besieging forces. The first is related by Appian, of the siege of Themiscyra in Pontus, by Lucullus in his war against Mithridates. Turrets were brought up, mounds were built, and huge mines were made by the Romans. The people of Themiscyra dug open these mines from above, and through the holes cast down upon the workmen bears and other wild animals, and hives or swarms of bees. The second instance is recorded in an Irish manuscript in the *Bibliothèque royale*, at Brussels, and tells how the Danes and Norwegians attacked Chester, which was defended by the Saxons and some Gallic auxiliaries. The Danes were worsted by a stratagem; but the Norwegians, sheltered by hurdles, tried to pierce the walls of the town—when, "what the Saxons and the Gaeidhil who were among them did, was to throw down large rocks, by which they broke down the hurdles over their heads. What the others did to check this was to place large posts under the hurdles. What the Saxons did next was to put all the beer and water of the town into the caldrons of the town, to boil them and spill them down upon those who were under the hurdles, so that their skins were peeled off. The remedy which the Lochlans applied to this was to place hides outside on the hurdles. What the Saxons did next was to throw down all the beehives in the town upon the besiegers, which prevented them from moving their hands or legs, from the number of bees which stung them. They afterward desisted and left the city."

Artistic Decoration.—Two theories of decoration were recognized by Walter Crane in a recent lecture: the organic, in which the decoration is an essential and integral part of the structure; and the inorganic, in which it is considered merely as so much superadded or surface ornament. With the development of Gothic architecture, sculpture, as indeed decoration of all kinds, became more and more important. It was strictly organic, being used to emphasize structural necessities. The sculpture of the Doric temple was also organic, though on a different principle. In the course of social and architectural evolution we have become more mixed and composite in our architectural styles. With complexity of life, complexity of form has increased, with the result that modern buildings have lost to a great extent that impressiveness which was due to simplicity and the organic relation between structure and decoration. Decoration may be considered from three points of view: from that of public sentiment and national characters and ideals, as the expression of the design, object, and purpose of particular buildings; from the technical point of view of methods and materials; and with regard to adaptation to climatic conditions. The decoration of buildings should be the highest form of art, as it was in the middle ages. The history and legends of localities should be carefully preserved in and identified with buildings. Churches have from time immemorial been the recipients of untold treasures of art and craftsmanship, and still seem to afford the largest field for the designer; but there is another sort of public buildings of ever-increasing importance—the school, in which permanent mural decoration might fill an important part in stimulating the imagination and forming the mind. In decoration attention should be centered upon some leading and distinctive feature. If sculpture is the method, inter-

est should be centered upon it. We can not go outside our own times. If we do not care for beauty and harmony in our public buildings, if we are entirely absorbed in seeking our individual prosperity and are oblivious of the social bond, we are not likely to get noble buildings and impressive decorations.

Labor's Share of Profit.—The purpose of a paper by Mr. S. N. D. North, on Some Fallacies of Industrial Statistics, is to point out the false uses that are made of these statistics and the "grotesquely erroneous" deductions that are based upon them. A study of them without thorough consideration of the relations of the various factors of which they are composed necessarily leads to wrong conclusions, and even when these elements are duly regarded, disturbances and variations are constantly interfering, and "fallibility lurks everywhere." Thus, the value given by the census of 1890 of $9,370,107,624 for the annual products of manufacture in the United States is a fictitious total, representing a vast conglomeration of duplications and reduplications of the finished products of one industry which become the raw materials of the next in the ascending industrial scale, and is about double the real value. There is no way, the author contends, of measuring, with any approximation to accuracy, what are the relative shares of labor and of capital from the results of their joint operation, as revealed in the census returns. The most essential factor for such a calculation—the prime value of all the raw materials in their first crude form—is missing. We do know, however, that the total return of wages by the eleventh census is more than fifty per cent of the aggregate amount added to the value of raw materials. Out of its less than half, moreover, capital has to pay its expenses, and this very seriously reduces its share, while it further has to suffer the loss by wear and tear. The return on capital invested in manufacturing enterprise and on the labor and brains required to manage and direct that enterprise is no larger than, if it is indeed as large as, the return upon the same amount of capital in mercantile and other commercial occupations. Rightly compiled and analyzed, the statistics show that labor gets the lion's share of the net product of industry; reduced to percentages, a share of not less than eighty per cent on the direct return in the form of wages paid to the operative class. Save in rare and exceptional cases, the share which the workingman receives is, as a broad general rule applicable to present business conditions, all that the industry can stand without driving the capital that operates it into some other and more lucrative channel.

Congratulations to Prof. Young.—A remarkable observation was made by Prof. C. A. Young during the solar eclipse of 1870. The dark lines of the solar spectrum are really luminous, and appear dark only by contrast with the much brighter vapors that lie back of those vapors of which they are the signs. At one moment of the eclipse—lasting only a second or two—these brighter vapors on the edge of the sun's disk are hidden, while the less luminous ones giving the dark lines are still in view. During that instant these usually dark lines should appear bright. During the eclipse of 1870 Prof. Young caught this happy moment, and saw this reversed, "flash" spectrum of bright lines. "All at once," he says, "as suddenly as a bursting rocket shoots out its stars, the whole field of view was filled with bright lines more numerous than one could count. The duration of the bright lines was only about two seconds, and the layer of vapors must have been under a thousand miles in thickness." At total eclipses since 1870 observations have been made going to confirm Prof. Young's views in a general way, but in none of them was a permanent record obtained till the eclipse of August, 1896, at Novaya Zemlya, when Mr. Shackelton, seizing the right moment, secured a photograph of the phenomenon. It consists of a very narrow spectrum of bright lines, which are indeed the Fraunhofer lines reversed just as Prof. Young had described them. "The congratulations of astronomers," says the London Times, "are due to Prof. Young on this complete, though late, confirmation of his observation of 1870, and of his views, speaking broadly, of solar absorption founded upon it." It is a curious circumstance that only three days before this eclipse Prof. Lockyer wrote to Nature that "to my mind the reversing layer is dead and buried already,

but may the Fates be propitious on the 9th and enable us to place a wreath on its tomb!" "The Fates," the London Times observes, "were indeed propitious in furnishing a funeral wreath, which, however, it would seem, must be placed upon the tomb of Prof. Lockyer's own theory."

At the Top of the Andes.—An attempt was made in December and January last by Mr. Edward Fitzgerald, a native of New York, and the Swiss guide Zurbriggen, to ascend Mount Aconcagua, supposed to be the highest peak of the Andes. They started on the 25th of December, and at the height of 21,000 feet found the card of Gussfeldt, the German explorer, in a tin box. The climbers were obliged to descend into the valley, but beginning a second attempt, December 30th, reached a height of 22,500 feet January 2d. On a third attempt the two reached the *arête*, 23,000 feet, January 14th. Mr. Fitzgerald had to turn back, but Zurbriggen continued on and reached the summit, the height of which has been variously estimated at from 22,422 to 23,910 feet. This competes with the height of Sir Martin Conway's ascent of Pioneer Peak in the Himalayas, which is also about 23,000 feet, in being the loftiest mountain ascent yet made. The previous highest ascent in recent years was that of Mr. Mummery and Mr. Hastings of 21,000 feet, on Nanga-Parbat, Himalayas. Mr. Fitzgerald has recently made an exploration of what are called the New Zealand Alps, and has published a book on the subject.

The Ideal of a Frieze.—Discussing Grecian architecture, Mr. H. O. Taylor observes, in his Ancient Ideals, that a frieze, on account of its shape, is adapted to represent a continuous matter. It can not well have a center toward which the rest tends, or even a center of supreme interest to which all the rest is accessory. It must rather, to vary the threatening monotony of its long line, show rising and falling waves of interest—quiet here to rest the spectator, vivid action there to excite his interest, and through all a rhythm of movement and a harmony of composition excluding everything which by disproportionate interest or size might detract from what precedes and follows. The Parthenon frieze effects this rise and fall of interest by the succession of groups taking part in the Panathenæa procession which forms its subject. We see stately maidens moving quietly, eager horses and their riders, magistrates and onlookers, till our eye finally rests with the seated gods. No one could see the whole frieze at once, but successive portions of it, as he walked beneath it. Hence it was fitting that the whole frieze should not present the same moment of time, but give the idea of a procession making ready, starting, and in motion—a plan which readily affords a rise and fall of interest. Some of the youths are not yet mounted; ahead of them are others on horses starting at slow pace, preceded by yet others in rapid gallop. Waves of rhythm appear in the rise and fall of the horses' limbs and bodies, while their heads, and still more the heads of the riders, remain more nearly on a line. This last conformity to the shape of a frieze gives a general tone of control and order to the squadron, and excludes all fear of the eager horses mastering their riders.

A Slavic Deity and St. Elias.—Peron, the thunder god, was an important divinity in the calendar of the Slavs of a thousand years ago and is a conspicuous figure in their folklore. An idol erected in his honor at Kiev about A. D. 980 had a silver head, a golden beard, and a wooden body. He was also commemorated in a famous idol at Novgorod. His name has been incorporated into a great many names of places, as is shown in a list compiled by M. N. Barsov. He was worshiped with human sacrifices. In 988 the Czar Vladimir, having been converted to Christianity, ordered all the figures of Peron to be pulled down, scourged, dragged at the tails of wild horses, mutilated, and thrown into the rivers or burned; yet his name abode among the people in many widespread legends, in which he figures as master of the thunder and the storms. As Christian and Hebrew saints were introduced to take the place of the heathen heroes, he became confounded with Elias, who is described in the Bible as having also a sort of command of the air and its phenomena. Elias was the first saint accepted by the Russian Christians, and was invoked to heal wounds caused by

firearms. As the Slavic Peron and the Scandinavian Thor traverse the sky during storms in chariots drawn by two horses or two bucks, and as Elijah ascended to heaven in the midst of lightnings and thunders in a chariot drawn by two horses, the Russian, Servian, and Bulgarian peasants hear in the thunder the rolling of Elias's chariot wheels and imagine him chastising God's enemies with thunderbolts. A solemn festival to Elias is held in Russia at the season when droughts usually occur, in which the saint is invoked to let the rain fall. There were at Novgorod in the middle ages two churches, one dedicated to Elias humid and the other to Elias dry, to which processions marched according to the kind of weather that was wanted. Other ceremonies of devotion to Elias as the saint of the storm, and legends giving him the attributes of their old thunder god and associating him with meteorological phenomena characteristic of the Slavic countries, are described by M. Henri Galiment in the *Revue de l'École d'Anthropologie*, all going to illustrate how hard it is to eradicate the ideas and customs of their olden times from the minds of the people, and how the old persists in living by the side of the new; and teaching that when two forms of religion are standing in rivalry with one another, the younger, even with the aid of the secular arm, can never supplant the older except by making concessions to it.

Asiatic and African Explorations in 1896.—The long list of geographical explorations accomplished during 1896, some of the most important features of which have already been mentioned in the Monthly, includes the exploration of a large region pertaining to the upper Yang-tse-Kiang River, Chinese Empire, by M. Bonin, a French officer in Tonkin, who visited countries not previously traversed by Europeans, and has been able to make important corrections in the map of the Yang-tse-Kiang and its tributaries. Dr. Sven Hedin, in exploring the Takla Makan, a continuation of the Desert of Gobi, has found the ruins of two of the towns said to be partly buried in the desert, and has made interesting investigations on the past and present hydrography of the Lob Nor region. M. D. Klements, sent out by the Siberian Geographical Society to the Khengai Mountains of northwest Mongolia, found a great glacier on the western slope of the mountain, and everywhere signs of former volcanic activity. A Russian expedition has been exploring the course of the Amu Daria, with a view to ascertaining if it would be possible to divert its waters by means of a canal into the Caspian Sea. The exploration of Asia Minor, predominantly archæological, has been continued by young men of the University of Oxford.

Antiquity of Writing.—It is observed by Dr. Bühler, in his book on Indian Palæography, that a very remote period is indicated for the beginning of writing by the fact that in a Jain text of about 300 B. C. its origin is forgotten and its invention attributed to the creator Brahma. Indian imitations of Greek drachmas prove that the Greek alphabet was employed in northwestern India before the time of Alexander the Great. Knowledge of the art of writing is established for the earliest Vedic period by one of the great works; and the grammarian Panini, who is assigned to the fourth century, mentions Greek writing and the words signifying writer. The evidence of the canonical books of Ceylon indicates that the knowledge of writing was pre-Buddhistic; and passages in the Jataka and in the Maha Vagga prove the existence, at the time of their composition, of writing schools and of a wooden slate, such as is still used in Indian elementary schools. Writing, as a subject of elementary instruction, is also mentioned in an inscription of the second century before Christ. The palæographical evidence of the Asoka inscription clearly shows that writing was no recent invention in the third century before Christ; for most of the letters have several, often very divergent, forms, sometimes nine or ten.

The St. Lawrence Drainage System.—The drainage system of the St. Lawrence River is characterized by Mr. G. K. Gilbert, in his paper on Niagara Falls and their History, as of exceptional character, in that it has no such continuous slope from the primary rill through the brook and succeeding tributaries and the river itself to the sea as mark the drainage systems of most other regions; but "the district is composed mainly of a group of great basins, like hollows, in each of which the surface slopes toward some

central point, and not toward the mouth of the river. Each basin is filled with water to the lowest point of its rim, and each of the lakes thus formed is a storage reservoir receiving a group of streams from the surrounding country, and pouring an even discharge over its rim to one of its neighbors." The Niagara River is thus, from one point of view, a strait connecting the two inland seas of Erie and Ontario occupying two of these basins; from another point of view it is a part of the St. Lawrence River—the part connecting the two expansions. "Viewed either way, it departs so widely from the ordinary or normal river that its name is almost misleading." Further, "a normal river receives most of its water directly from rain or melting snow and varies with the season, swelling to a flood in time of storm or at the spring snow melting, and dwindling to relative insignificance in time of drought. The water of Niagara comes only remotely from storm and thaw. The floods of the tributaries are stored by the lakes, to whose broad surface they add but a thin layer. The volume of Niagara depends only on the height of Lake Erie at Buffalo, and from season to season this height varies but little. On rare occasions a westerly gale will crowd the lake water toward its eastern end, and the river will grow large. On still rarer occasions a winter storm will so pile up or jam the lake ice at the entrance to the river as to make a dam, and for a day or two the river will lose most of its water." The wastings of soil and gravel that are usually carried along by the streams in their course are carried by the tributaries of the St. Lawrence system only to the lakes, where they settle to the bottom. Hence, "Niagara is ever clear. Sometimes, when a storm lashes the shores of Erie, a little sand is washed to the head of the river and carried down stream; sometimes a little mud is washed into the river by the small creeks that reach its banks. Thus Niagara is not absolutely devoid of load, but its burden is so minute that it is hard to detect."

Himalayan Tea Porters.—Darjeeling tea, said Mr. George W. Christison, in a lecture before the British Society of Arts, is all carried by the hardy hill-men up the steep mountain roads to the nearest railway station on the way to market. It is no unusual day's work for a coolie to carry a tea chest, weighing from one hundred and ten to one hundred and thirty pounds, a distance of five or six miles, making at the same time an ascent of from twenty-five hundred to thirty-five hundred feet in sheer vertical elevation. There can be no deception about a task like that, and we can not but have an admiration for the powers of endurance of those who perform such a feat. Of course, these people are trained to load-carrying and mountain-climbing from their very infancy, and hence the peculiar set of muscular faculties required for them are fully developed, if not actually called into existence at the cost of others—so much so that walking on a level, after a few miles, becomes positively painful to them. In the prosecution of their own trade, or in domestic affairs, they frequently undertake long, arduous journeys over ridges and along and across hot valleys, varying many thousands of feet in elevation, occupying many days, carrying heavy loads of from one hundred and fifty to two hundred pounds, and over and in addition to their food and bedding most cheerfully lighting a fire, cooking and eating their scanty meal, and going to sleep by the wayside. There is a story still current of a Bhootean in old times having carried a grand piano up the hill to Darjeeling, a distance of fifty miles forward, and involving a rise of more than five thousand feet in elevation by the old road. These hill tribes are a hardy people, capable of performing marvelous journeys without partaking of food, or on the most meager fare.

Progress in Botanical Study.—In connection with the history of the Botanical Gazette, Prof. C. E. Bessy has given in a paper on the Evolution of a Botanical Journal, read at the University of Nebraska and published in the American Naturalist, a view of the growth of interest in botany in the United States. The Gazette was started in November, 1875, by Prof. John M. Coulter, of Hanover College, Indiana, as the Botanical Bulletin, a monthly publication of four pages. Its name was changed in the second year to the Botanical Gazette. Its editorial force was increased from time to time, it went through several enlargements, and improvements were made in it; in ten years it

had won an established position. The twentieth volume, instead of 52 pages of short, mostly local notes, had 568 pages of structural, physiological, ecological, systematic, and paleontological matter. Now a further enlargement has been found necessary, under which the numbers will average 65 pages each, and the magazine becomes one of the publications of the University of Chicago, with a still further increased editorial force, to which it is contemplated to add one or more European botanists. The magazine, Prof. Bessy says, "has grown and developed as the science of botany has grown and developed in this country. When we look over the earlier volumes with surprise at the little notes which fill the pages, we must not forget that American botany had not then generally risen above such contributions. It is true that we had a few masters in the science, but these masters wrote little for general readers, and their technically systematic contributions were mostly published in the proceedings of learned societies. The one thing which stands out to-day in sharp contrast with the botany of two decades ago is the very great increase in the number of masters in the science who are making liberal contributions from many different departments."

MINOR PARAGRAPHS.

ALFRED NOBEL, the inventor of the application of dynamite as an explosive, left a bequest for the institution of five equal prizes, to be awarded yearly to the persons who shall have made the most important discoveries or inventions in the domains respectively of physics, chemistry, and physiology or medicine; who shall have produced the most important work, in the ideal sense, in the domain of letters; and to the person who shall have exerted the greatest or the best action for the fraternity of peoples, for the suppression or diminution of permanent armies, and for the formation or spreading of peace congresses. The literary prize is to be awarded by the Swedish Academy, and the prize for the promotion of peace by a committee of the Norwegian Storthing. It is the testator's expressed wish that no consideration of nationality may enter into any of the awards. The prizes are supposed to be worth sixty thousand dollars each.

A NEW flying machine, similar in principle to that of Lilienthal, has been devised by Herr Arthur Stenzel, of Altona, Germany. It has parabolic wings in imitation of birds' wings, is driven by the power of compressed carbonic acid, and has been made to "go" when attached for safety to a guiding cable. With a force of one horse power it has advanced three metres at each beating of the wings, of which there are one and three tenths per second. With a horse power and a half the machine may be made to fly free from the cable. The wings are remarkably elastic, and the inventor thinks that this is one of the factors of his success. They are made of unsoldered steel tubes and bamboo, and are covered with a specially prepared India-rubber cloth. The apparatus is directed by a rudder which is not unlike a bird's tail. As yet no passengers have been carried on the machine.

A SUM of ten thousand francs was bequeathed a few years ago by M. Edouard Mailly, of the Royal Academy of Belgium, as the foundation of a prize to be awarded to a Belgian who has contributed most to the progress of astronomy or to the spread of the taste for it and knowledge of it. The prize "Mailly" has been fixed at one thousand francs, to be awarded every four years. The Belgian Academy in December, 1896, made the first award of the prize, and bestowed it, most worthily, on the editorial committee of our contemporary, *Ciel et Terre*.

THE oldest known measurement of the height of clouds is asserted by M. Schreiber, of the Belgian Astronomical Society, to be the work of the two Jesuits Riccioli and Grimaldi, near Bologna, in 1644. They used the trigonometrical method, with two stations, which is still preferred, and which Kamtz, in his treatise on meteorology, calls Riccioli's method. They found 3,222 metres as the altitude of a bright white cloud; Riccioli relates that another Jesuit, of Metz, who measured a large number of clouds, told him that none of them was more than 7,400 metres above the earth. He speaks of another

method, proposed by Simon Stevin, of measuring by means of the shadow. For thunder clouds the time between the lightning and the report was calculated. Riccioli also mentions the luminous clouds seen late at night, which have again begun to attract attention within a few years past.

THE two expeditions, one French and one American, which are at work unearthing antiquities in Babylonia have, it is stated in the London Daily News, recently made some valuable "finds." The first and most notable result of the excavations is that the history of the Babylonian people as recorded in cuneiform writings on tablets is carried back at least twenty-two hundred and fifty years further than it had yet been known. In other words, there is now abundant written evidence that the Babylonian people existed and were civilized enough to be able to write at least seven thousand years B. C.

THE British consul at Funchal is authority for the following regarding banana cultivation in Madeira. There are two varieties generally grown, the dwarf banana (*Musa Cavendishii*, of the order *Scitaminea*) and the silver banana. The latter is much the more delicate in flavor and only about half the size of the dwarf variety, but is seldom exported, as the total quantity grown in the island is scarcely sufficient to supply the home consumption; but if this variety of the fruit were generally known it would be in greater demand, as it has so much better an appearance and is more delicate in flavor than the dwarf variety that those who have once eaten it seldom use the latter except for cooking purposes. The greater part of the bananas are grown on the south side of the island. The season lasts practically the whole year, but the fruit is in its greatest perfection from July to December.

THE archæological map of Ohio of the Archæological and Historical Society of that State, although only about one third complete, has already upon it twenty-one hundred marks, representing between fifty-five hundred and fifty-six hundred remains. Some interesting facts, Dr. Brinton says in Science, have been brought to light in the surveys: that the mounds, earthworks, village sites, etc., generally followed the streams; that in the Scioto Valley there are very few stone monuments, but that in the Muskingum Valley, along the Ohio River, and in Brush Creek Valley, Adams County, stone monuments predominate over those of earth. Seven counties in the State have yielded nine hundred and eighteen monuments. The counties in northeastern Ohio average five or six mounds or village sites each. It is estimated that the number of recorded monuments may reach eight thousand.

A COMPARATIVE review of the composition of a number of American kaolins makes it evident that the wide difference in the proportions of clay and silica in them renders it imperatively necessary that the variations be taken into account in the selection of materials for the manufacture of ware; and that the United States is not wanting in an abundance of material for making porcelain equal to the best foreign production. The kaolin used in the Royal Berlin Factory at Charlottenburg is taken as the standard of comparison. One of the purest kaolins is found in Indiana, and clays of similar quality exist at Hockessen, Delaware; Northampton County, Pennsylvania; and Middlesex County, New Jersey.

THE wood of the *jarrah*, or *Eucalyptus marginata*, of southern Australia, is said to be very valuable for use where wood is to be brought into contact with soil and water. A tree fifty years old may furnish logs two feet in diameter at the base. The wood is red, takes a good polish, and is easily worked. Another eucalyptus, the *karri*, or *Eucalyptus diversicolor*, producing marketable timber in from thirty to forty years, has a red wood, hard and heavy, tough and not easily dressed, and is adapted to bridge flooring, planking, and beams. It is largely used in London for street pavements, as its surface is not easily rendered slippery.

AN interesting investigation has been undertaken by the British Marine Biological Association of the exact nature of the sea bottoms at Plymouth, with the groupings of the fish and their food animals upon them. It has been recognized for some time that the localities frequented by many marine species are very definite and extremely limited in extent, and that the nature of the sea bottom and the creatures that live there

exhibit as much variety as we are accustomed to find on land. Detailed charts will be made to show the variations that take place from point to point. Such investigations of the kind as have been made heretofore have had regard chiefly to the fishes, while comparatively little attention has been paid to the other features.

NOTES.

A CORRECTION.

To the Editor.

DEAR SIR: I beg leave to call your attention to a mistake in my article on The Malarial Parasite, which I regret to say must have been in the original manuscript and which escaped me when reading the proof. On page 635, thirteenth line from the top, the word "quartan" should have been "tertian." It is evident that when a daily paroxysm occurs this is due to the alternate development of two groups of tertian parasites, in which the cycle of development is forty-eight hours, and not to two groups of quartan parasites, the cycle of development of which would be seventy-two hours.

Very truly yours,
GEORGE M. STERNBERG.

THE summer lectures in botany of the Torrey Botanical Club and the College of Pharmacy of the City of New York will be given at the college, 115 West 65th Street, in two weekly courses: the first, on the General Morphology of Plants, Fridays, at 4 P. M., by W. Arthur Bastedo, beginning March 26th and closing June 11th; and the second course, on the Summary of Cryptogamic Botany, with practical work on the microscope, Thursday evenings, by Dr. Smith Ely Jelliffe, March 25th to June 10th. The prices of tickets are $5 to the first course and $10 to the second course. The eight Saturday excursions (stormy Saturdays excepted) will begin April 24th. Tickets for either course may be obtained now at the college.

THE American trout—"rainbow trout" as the French call it—is found by M. Hugues Oltramare to be of very much more rapid growth than either the European lake or river species, and therefore presumably a more profitable kind to raise. The fry of the species of the same age are very readily distinguished by the superior size of the Americans. The latter are also more active, more constantly in motion, and eat more.

THE results of experiments made some time ago by Dr. Lösener on the effect of the conditions of burial on the microbes and germs of disease are reassuring. Infected carcasses were buried under conditions like those of ordinary burials. The duration of the vitality of the pathogenic organisms was various, but all were dead within a year except the anthrax bacilli, which retained their full complement of virulence during the whole period. None of the organisms either, except those of anthrax, found their way to the adjacent soil and water; but so admirable a barrier is provided by the soil that the earth close beneath the bottom of the hole containing the infected carcass was in every case found quite devoid of pathogenic germs. Experiments made in Massachusetts with sewage have shown that filtration through soil is effective to purify from bacteria.

THREE deposits of volcanic ash in Nebraska are described by Prof. Rollin D. Salisbury in Science: at Ingham, Edison, and Orleans. At all these places several more or less associated exposures of the ash appear; and in all the cases it is found in the side or near the head of a cañonlike ravine. It varies in color from white to yellow cream or light gray, and in grain from the grade of coarse sand to that of white flour. In some places the bed is more than twenty feet thick. Such ash has been found in other places in Nebraska, and it has already become an important article of commerce, under the name of pumice.

PROF. MAX WOLF has continued with success the method, which he began in 1861, of discovering new minor planets by the small shift of their images, due to orbital motion, on a photographic plate exposed behind a large portrait lens. Since 1890, Prof. Wolf has discovered fifty-six new planets, of which thirteen were found in 1896. The whole number of small planets which have been calculated is now four hundred and twenty-two.

A NEW breed of fowl has been systematically created in France by a M. Gourgaud —dwarfs of the breed called there Gâtinais, or gâtinais bantams. Associating with a gâtinais hen an ordinary white double-crested bantam cock with blue toes, M. Gourgaud obtained a nest of half-dwarf chickens having single crests and double crests, and some blue and others rosy toes. He then went to work to eliminate the double crests and blue toes, directing the association of pairs to that ideal, and approaching it more nearly with each successive generation. In 1895 he had obtained a fixed dwarf breed, with rosy toes and single crests.

THE primitive relations between Europe and the East Mediterranean countries were a prominent subject of discussion in the Anthropological Section of the British Association. The sectional presidential address of Mr. Arthur J. Evans related to it, and papers bearing upon it were read by Dr. Montelius, Prof. Petrie, Mr. J. L. Myres, and others.

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Equality will probably be published in the latter part of April. Publication will be simultaneous in the United States, Great Britain, France, Germany, Switzerland, Belgium, Spain, Italy, and other countries. It is of interest to recall that over 400,000 copies of "Looking Backward" have been sold in this country. The book has been translated into the language of almost every civilized country, and its total sale is almost beyond computation. Quite recently the demand for literature dealing with sociological questions has led to the printing of a quarter of a million at a low price in England.

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HAMLIN GARLAND'S BOOKS.

Messrs. D. Appleton and Company have the pleasure of announcing that they have become the publishers of a list of Mr. Garland's books, which is headed by his new work entitled *Wayside Courtships*. The stories in this book deal with the same theme, the influence of woman, exerted often by chance, upon this or that career, and the quality of treatment shows the advance of this strong and talented American writer. Other new books by Mr. Garland will be announced later. The publication of *Wayside Courtships* will be accompanied by the appearance of new editions of Mr. Garland's vigorous studies of political life, *A Member of the Third House* and *A Spoil of Office*, and also of his graphic story, *Jason Edwards*. These books will be issued in a uniform edition.

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***

DR. BENSON'S "CYPRIAN."

The late Archbishop Benson's book on Cyprian, about which there was a good deal of talk last year and this, will be issued shortly by D. Appleton and Company with an Introduction by Bishop Potter. Dr. Benson's rare intervals of leisure were for many years devoted to the preparation of this work. His final revision was all but finished at the time of his death. The book is to be entitled *Cyprian: His Life, his Times, his Work*. It was not merely that the author was attracted by the "powerful and fascinating personality" of that Father of the Church. Cyprian interested him for reasons which will be appreciated by observers of the religious revolution now in silent progress over the Christian world, and by observers, whether or not they are Christians in the dogmatic sense, for Dr. Benson regarded Cyprian as the Father who had "done most to turn the pagan to the Christian temper in the world." Cyprian appeared to him to "have dealt masterfully with lasting problems in the Church, and to have left behind him a living theory—so living that the 'ecclesia principalis' has never ceased to fret over it and retouch it." This important work is to be in one volume. Several original documents will be printed in it, and it will contain maps. It will be awaited with special interest, in view of the recent papal bull denying the validity of the Anglican clerical orders.

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***

NEW EDITIONS.

The Seven Seas, by Rudyard Kipling, was published about December 1st. A second edition was reached by January, a third edition by February, and the fourth edition, printed about March 1st, seems likely to be followed by another shortly. No book of the last year has met with such a magnificent critical reception.

In the second edition of Prof. Ward's *Dynamic Sociology* the author's preface reviews the progress of sociology in the last fourteen years.

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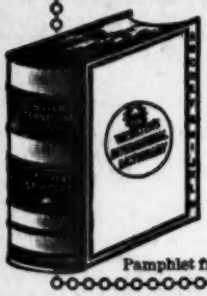

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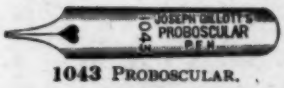

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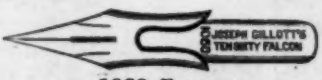

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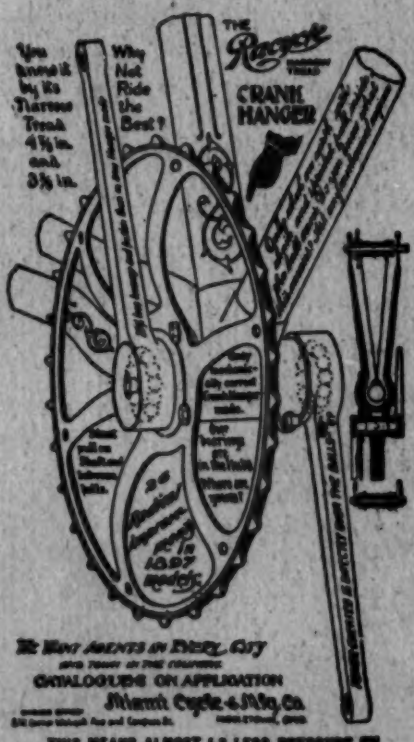

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